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# LINUX



THE COMPLETE MAGAZINE ON OPEN SOURCE

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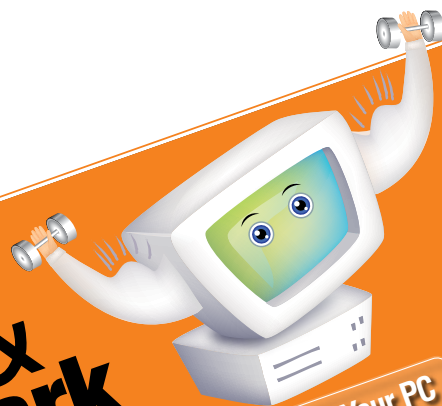
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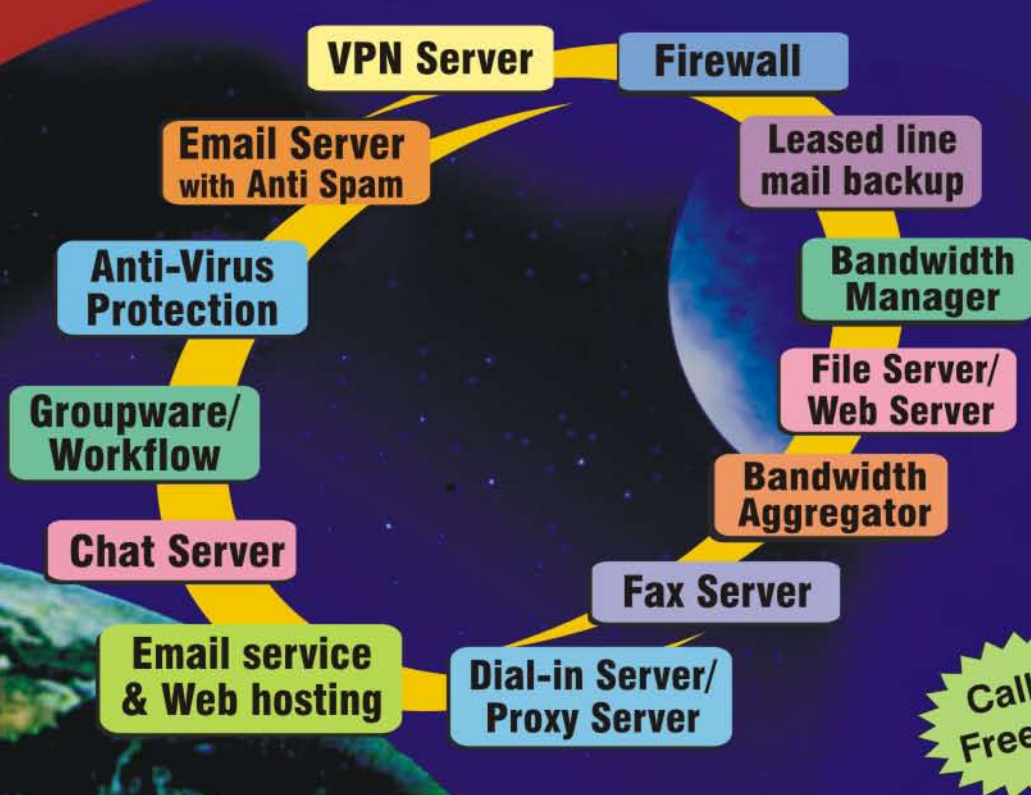
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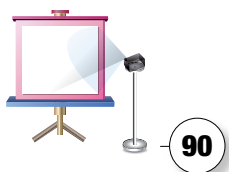
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# Editorial

Dear Readers,

When netbooks first emerged, Linux was considered the only viable solution for these devices. However, as it happens all the time with the market tactics of a certain other player, the open source OS has almost disappeared from these devices too. Nowadays, it's become really hard to find a netbook with preinstalled Linux.

So, what's to be done? We can either wait for the market dynamics to change or take matters into our own hands and drive this change ourselves—like we did with laptops in the past. Our persistence in not using that other OS, has made even a heavyweight like Dell offer Ubuntu preinstalled—although not in all parts of the globe! But then, we should continue to campaign. The easiest is to choose the path of 'format and reinstall'!

We can bring the concept of format and reinstall to netbooks too. So, here's an open question: Which distro do you run on your netbook? Ping us, because we'd love to hear from you. Meanwhile, if you're planning to buy one, which brand and model would you like to go for? I guess, you are also wondering whether it would run Linux, if at all!

Currently, the scenario with netbook hardware compatibility is as dicey as it was with laptops, half a decade ago. Things have changed, for the better over the last few years. If we don't get Linux preinstalled on our laptop, we can exercise our rights to format and reinstall, without worrying about whether the hardware will support Linux or not. With respect to netbooks now, our job is to test these devices and flood the Web (and print) with information on netbook models that are Linux compatible.

Okay, it's now time for me to make a confession: after getting an overwhelming number of queries from our readers, we thought it was about time we picked up the topic and did our bit. So, come next month, we hope to present you with a comparison of hardware features, as well as the Linux compatibility of some of the netbook models available in the Indian market. Also, we'll try to analyse which netbook OS is the best fit, as of now.

Talking about OS, as I write this editorial,

Distrowatch has just announced the release of Ubuntu 9.10 RC. The final release is on October 29. Mandriva 2010 is at RC2, with the final scheduled for November 3. If things go as per schedule, by the time you are reading this both the distros should be out. You may wonder if these are possible inclusions for our December issue... Of course, they are!

By the way, openSUSE 11.2 final is scheduled for November 12. Now what do we do about that? Ubuntu fits into a CD, while Mandriva takes up a DVD. Does that mean we'll make you wait for another month for openSUSE? Meanwhile Fedora 12 is also scheduled for November 17 (unfortunately, the date is too late to be considered as a DVD option. Phew!). So, what's in January 2010? Fedora or openSUSE?

*The easiest is to choose  
the path of 'format  
and reinstall'!*

Personally, I wouldn't have wanted to wait for months before laying my hands on the latest distro. And let's face it, these are the BIG ones! A colleague made a suggestion—hike the magazine's price by Rs 10, go for a dual-layer DVD and fit in both openSUSE and Mandriva. Sounds like a deal? You bet!

But why a price hike? Well, that's to cover the additional cost of a dual-layer DVD. And this will only affect those who buy it from the newsstands—the subscribers are safe! Another reason why you should subscribe :-)

With that, I'll stop the self promotion. Hope you enjoy reading the November issue before we come back in December with a blast!

Best Wishes!



Rahul Chopra  
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# You said it . . .



It's good to see the Slackware Linux and OpenOffice 3 CD/DVD with the October issue. Thanks for it.

I read the feedback from fellow reader Hartmut in the 'You Said It' section about the lack of hardware support in Linux. First of all, I would like to share my experience on Linux...

A few months back while downloading Debian Lenny on my new Dell Inspiron 1525 laptop (unfortunately, on Windows Vista), I thought of having an alternate Internet connection using my Nokia 3220 (which is pretty old!) phone. I downloaded the Nokia PC suite for Windows, purchased the data cable for less than 200 rupees (surely it wasn't Nokia's) and thought it would work. But alas... the Nokia Suite (running on Windows) didn't recognise my phone even after installing the phone's cable driver, and this was only because of the cheap cable. This forced me to drop my plans as purchasing a branded data cable would have cost me more than Rs 500 (at least).

So I installed Debian Lenny and tried to connect (using the same phone and the cheap cable) to the Internet using the wvdial method, which is also mentioned in the October issue's Q&A section. Wow! It not only recognised the phone's modem, it worked very smoothly (out-of-the-box) and I didn't need to replace the cable either. It saved me from having to spend extra money too.

As far as printers are concerned, I have used HP 3550 and 656c, which are older models and they too worked well on Linux (again, out-of-the-box), while on Windows, I've had to search for the Vista drivers for these models to work (which I didn't even try to do).

So, from my point of view, I don't think that there is lack of hardware support in Linux. Instead, maybe there is lack of 'easy' support because we have to do a lot of research/googling to find out what the problem is before getting the solution. But being a Linuser, that's part of the fun, right?

I don't deny that there might be some problem with the Epson printer/scanner Hartmut is using, but the Linux community support is so strong that the solution will be out soon. And at least, it's not that kind of 'proprietary' support where you have to send chains of e-mails or select a number of options just to explain, "The driver is not supported; could you please provide a new driver," and finally get a response like, "Sorry sir, we don't support this model anymore!"

—Anant Vyas, [anant.vyas23@gmail.com](mailto:anant.vyas23@gmail.com)



I write this mail regarding feedback on the Epson printer not working on Mandriva 2009.1. Let me share a story with you. I bought my HP Photosmart D5368 printer in April this year. It has a host of non-standard printing features, including printing directly onto CDs and DVDs, plus automating paper type detection and verification (if I select plain paper as the paper type but feed in photo paper, it will not print). And, it connects via USB. My computer is also self-made, with an ASUS M2N-CM DVI MoBo and a 2.3 GHz triple-core AMD Phenom processor.

The printer came with two CDs—one with drivers for Windows and Mac, and another with CD label printing software, for Windows only. At that time, I was using Windows XP Media Centre Edition 2005 SP3, and Ubuntu 9.04 Jaunty Jackpole. I unpacked my printer, plugged it in, switched on my PC, booted Ubuntu and printed. A perfect test page came out. I even verified that CD printing worked. Cut to Windows XP; I went through the two CDs, and then went through a series of IRQ conflicts, reconnected cables at least a dozen times and installed a second device node for my printer before I could print.

I believe your problem lies with the I/O controller on your motherboard, which manages the USB ports. Either that's faulty, or the standard USB drivers don't work properly with it.

For the future, I would also suggest

you switch your printer to an HP model. When I purchased mine, Canon Pixmas, with better quality at half the price, were available. I stuck with HP because of the HPLIP (Hewlett Packard Linux Imaging Project) where HP developers work to make open source drivers available for Linux and BSD. This is probably the only instance where the device manufacturer works on fully free open sourced drivers, which support the full functionality (not merely the 'just works' bit).

—Boudhayan Gupta, [bg13.ina@gmail.com](mailto:bg13.ina@gmail.com)



This long drawn-out discussion seems to be related to just a single specific problem. I use Ubuntu on a Compaq Pentium 4 (2004 model) desktop and bought an Epson Stylus CX2800 (USB printer-cum-scanner) in 2007 on the assurance from an Epson sales executive that it would work in both Windows and Linux, and that the company's trained technician would install it on both. The 'trained' technician who came, however, did not know what Linux was and made a mess of installing it even on Windows. I had to uninstall and reinstall it in Windows, by following the instructions from the installation CD. For Linux I had to turn to the Internet.

Epson mentions only the Windows operating system in its requirements, and gave only Windows drivers and installation files in the CD. However, it has an associate [[www.avasys.jp](http://www.avasys.jp)] that develops and maintains a repository of Linux drivers/installation files for various models of printers, scanners and MFDs. We have to download it from the associate's site. The procedures given are lengthy CLI steps. I succeeded in installing the printer, but it performed only a few of the functionalities compared to its performance on Windows. But then I could swiftly install the printer with complete functionality from the Ubuntu GUI using the driver for model number CX3800, which is built into Ubuntu. I could not install the scanner, and had to



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# You said it . . .



hang on to Windows only for that reason.

After reading about this matter in the October 2009 issue of *LFY*, I went back to *avasys.jp* hoping that in the meantime Epson would have developed a friendlier Linux installer for the scanner. Sure enough, it was there—a *.deb* file specifically meant for Ubuntu. The scanner was installed in a jiffy through the Ubuntu GUI in just two mouse clicks. Finally, I celebrated my liberation from Windows with a glass of wine.

—**JS Karkada, eddykabootar@yahoo.com**



Thank you for doing such a wonderful job of promoting the open source concept. To be frank, I was a hardcore Windows user and supporter but after coming across *LFY*, my views have changed a lot and now I use only Linux (CentOS). I like to stay updated about the latest software and especially the operating systems. I don't have a broadband Internet connection, which prevents me from downloading the OS ISO images. But thanks to the *LFY* team, this problem has been taken care of by the magazine providing us with the latest operating systems every month.

After reading the last issue I came to know about the System Rescue CD and I downloaded it. I was quite fascinated by the disk cloning facilities provided by *partimage*. However, I have a query. If two of my systems have totally dissimilar hardware except the CPU architectures (i.e., if both are x86 systems), will the clone of one of the systems work on the other system?

—**Anirban Saha, anirbansaha2009@gmail.com**

**ED:** Thanks for sharing your feedback and encouraging us to keep doing better. We are glad that we could help you enjoy the world of open source. As for the query on *partimage*, I would like to invite the author to take charge.

**Rajesh Sola:** As far as Linux is concerned, it is highly portable—i.e., the

*OS installed on one PC works well with most other systems even if the hardware, besides the CPU architecture, is different. So the same thing applies to images taken by partimage. But most of the time, the display will not work immediately when a graphics card changes. In such a case, you need to modify your `/etc/X11/xorg.conf` file as per your new display settings by booting to the fail-safe/recovery mode. When I tried to use an Ubuntu image across systems with AMD, Intel P3 and P4 processors, it worked well on tweaking the display settings.*

*So the bottom line is compatibility and depends on how a particular OS is portable to different hardware—there is no role played by *partimage* here. It's like checking the compatibility of an OS when the hard disk is removed from one machine and plugged into other.*

*A small clarification on the term 'cloning' used in the query: 'cloning' means to copy the disk or partitions (which is done by *g4u*). The operations done by *partimage* can be referred to as imaging or back-up/restore partitions.*



You guys really rock and I like your site. I looked for an option to submit a case study/article but I couldn't find any direct option. Could I know the procedure? Also, I wanted to know whether you only accepted articles based on Linux?

—**Malini, malithenerd@gmail.com**

**ED:** Thanks! The 'Write for Us' link is on the website's top grey bar :-). Here's the direct link [www.linuxforu.com/write-for-linux-for-you](http://www.linuxforu.com/write-for-linux-for-you).



I read *LFY* regularly and feel very happy about the content and presentation. It is very informative for students as well as the faculty members, especially for those who pursue the FOSS philosophy. We, at the department of computer science and engineering, Govt. Engineering College

Sreekrishnapuram, Palakkad, Kerala, have completely switched to Linux, and have started reaping the benefits.

At the same time, I have a feeling that a magazine such as yours shall not promote negative tendencies like animosity towards a firm or product (Microsoft or any other) and should discourage events like Winblast (mentioned in Aug09 issue as part of a FOSSday celebration). Our approach should be based only on technical considerations and let the consumer decide which is best for him.

I would also like to mention that a student group graduated from our institution has set up a reasonably successful venture specializing in ERP solutions based on Open Source Software at the Technology-Business Incubator at National Institute of Calicut.

—**Dr P C Reghu Raj, professor and head, department of computer science and engineering**

**ED:** Thank you for sharing your valuable feedback. We're indeed delighted to know about the 100 per cent FOSS-powered department of computer science at your college. Also please pass on our congratulations to the students who undertook the project at the National Institute of Calicut.

We also appreciate your concerns regarding 'Microsoft bashing'. As a magazine, we certainly don't encourage animosity towards any firm or product. The Winblast event is just an inside joke, and is quite widespread across colleges. Anyway, we'd try to keep away from 'useless' Microsoft bashing whenever required.

Please send your comments or suggestions to:

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# KNOW HOW



**Q I have the Fedora 11 DVD that came with your magazine. I am currently using Windows Server 2003, which I would like to remove and replace with Fedora 11 for DNS and proxy servers. However, I don't know how to create the DNS with Fedora 11. Please guide me on how to create the DNS server for my institute.**  
**—Dange Laxmikant, Nanded, Maharashtra**

To install and configure the DNS server, you need to install the BIND (Berkeley Internet Name Domain) DNS server. The best way to install BIND is by using the *yum* package manager as follows, after making sure you're connected to the Internet:

```
#yum install bind
```

This will install all necessary packages. Now go through the documentation on BIND at [http://www.redhat.com/docs/en-US/Red\\_Hat\\_Enterprise\\_Linux/5.4/html/Deployment\\_Guide/ch-bind.html](http://www.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/5.4/html/Deployment_Guide/ch-bind.html) and configure your server.

You can also install Squid to make your Fedora 11 a proxy server using *yum*. Here are the steps for a basic Squid installation and configuration:

```
#yum install squid
```

Open the */etc/squid/squid.conf* in any text editor and define an ACL

(access control list). The following is an example of an ACL statement:

```
acl my_network src 192.168.1.0/24
http_access allow my_network
```

Remember to change the IP address as per your network. The default port is TCP 3128, which you can change by putting the following statement in the file:

```
http_port 8080
```

Now save and close the file before starting the Squid server as follows:

```
# /etc/init.d/squid start
```

Run the following commands so that Squid starts automatically when you reboot your system.

```
# chkconfig squid on
```

On the client machine, open a Web browser and configure it to use the proxy settings.

You can go through the *squid.conf* file and make other changes as per your requirements.

**Q I have installed CentOS 5.3 on my server. I often use yum to install and update packages. I want to know if there is any way I can just download all the RPMs that are needed to install a package along with its dependencies.**

**—Mohan M, Chennai**

In order to only download packages using Yum, you need to install the *yum-downloadonly* plug-in:

```
# yum install yum-downloadonly
```

Now, run the following command:

```
# yum update firefox -y --downloadonly
```

This will download and store the packages in the */var/cache/yum/* directory. You can even specify a directory of your choice, as follows:

```
# yum update firefox -y --downloadonly \
--downloadaddir=/tmp/lfy/
```

*yum* will download all the packages needed to update Firefox, but will not install any of them. Instead, it will quit with a message after the download is complete, similar to what is shown below:

```
exiting because --downloadonly specified
```

**Q I use Fedora Core 6 on one of my systems. I often face problems while unmounting my CD-ROM drive. I get a message stating that the device is busy, even when I run the *eject /dev/hdc* from a terminal. Please help me resolve the issue.**

**—Neelam, Kanpur**

Try the following command...

```
# fuser -km /dev/hdc
```

...and then:

```
# eject /dev/hdc
```

This should work!

**Q I'm really new to Linux. I want to play MP3 files. Please guide me through the whole procedure and terminal commands.**

**—Syed Aamiruddin, by e-mail**

Please follow the steps given in the following site: <https://help.ubuntu.com/community/RestrictedFormats> 

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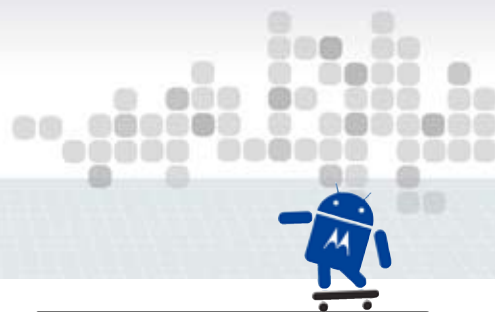
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## OSS changing the face of content management market: Report

The content management market is seeing dramatic changes thanks to new open source and commercial open source entries that are making significant inroads with customers. According to *The Definitive Guide to Today's Content Management Systems and Vendors*, a new 150-page report series from Basex, a knowledge economy research firm, the advent of open source software has significantly changed the process of selecting a content management solution.

The report series looks at 32 key content management vendors and 43 platforms, and provides an analysis—including market trends, drivers, and barriers—to guide decision makers in the selection process. Basex estimates that the US market for content management was \$4.1 billion in 2008 and will reach \$10 billion by 2014. Open source content management is gaining traction in some circles and the overall open source software market is growing rapidly.

The report reveals that choosing the right content management system is far from straightforward and requires an in-depth understanding of both the organisation's needs and what the market has to offer. It points out that companies need to be prepared to manage multiple forms of content, including wikis, blogs, RSS feeds, social networks, podcasts and video. Also, companies that spend hundreds of thousands of dollars for content management systems might do equally well with platforms that cost one-tenth that amount.



## Palm to open doors to WebOS developers by Dec

Following up on the release of the beta app catalogue e-commerce programme, Palm is planning to open its app distribution programme to the entire Palm WebOS developer community by the end of the year. Under the programme, developers will receive 70 per cent of the revenue after tax deductions.

Developers who charge for their software will need to set up a PayPal account to receive their share of revenue from Palm, who will keep 30 per cent. Customers will initially be able to purchase applications with MasterCard and Visa.

The company's membership-based programme will have a \$99 annual fee for developers of proprietary applications, while developers of open source software won't be required to pay the programme fee, states the company blog. As announced

in August, the company is accepting applications to the beta app catalogue e-commerce program for distribution on the catalogue.

Palm also plans to launch a full-scale developer program to encourage third-party applications for its WebOS platform by the end of the year, and is making a special pitch to open source developers.



## Motorola dumps LiMo for Android!

Motorola is busy focusing on Google's Android these days, and has quit the LiMo Foundation. Christy Wyatt, vice president, software applications and ecosystems, Motorola, mentioned that she was no longer on the board of the LiMo Foundation, as reported by *PC World*. The company has decided to remain as an associate member and retain an active role as a contributing member. As a result, Motorola is now no longer listed as a founder member on the LiMo website; it is also now ineligible to run for a board seat. In 2010, the company plans to release a host of mobile phones that will use Google's Android OS.

## SCO fires CEO McBride

UNIX software vendor SCO, struggling through bankruptcy and a UNIX copyright trial, has fired president and CEO Darl McBride. This move, along with a restructuring effort, came after an operations and cost analysis performed by SCO's Chapter 11 trustee. Since the CEO position was eliminated, its management team now consists of COO Jeff Hunsaker, CFO Ken Nielsen and general counsel Ryan Tibbitts. SCO says it will finalise details of the restructuring and reach "...cash flow break-even for core operations" within a month. A "modest reduction in SCO's workforce" and other changes will help improve SCO's financial position, the company says. SCO is attempting to raise additional funding and sell non-core assets.



# Thank You IIT Madras

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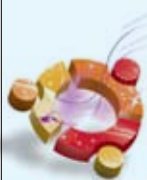


## IBM responds to Windows 7 launch with Ubuntu Desktop

With an aim to take away the forthcoming market share from Microsoft's most talked-about Windows 7 (launched on October 22, 2009), the biggest rival IBM is teaming up with Canonical against Windows 7. In September, the company struck a partnership with Canonical, which resulted in the launch of an Ubuntu-based desktop bundle in Africa. Now, the cloud and Ubuntu-based software package, which is part of IBM's Smart Work Initiative, will soon be debuting in the US.

Independent market estimates range up to \$2,000 for the cost of migrating to the Windows 7 operating system for many PC users. New PC hardware requirements account for a significant portion of the added expense. However, the Ubuntu-based desktop package includes IBM's free Lotus Symphony productivity suite; e-mail from IBM Lotus Notes or the cloud-based LotusLive iNotes which starts at \$3 per user, per month; Cloud-based, social networking and collaboration tools from LotusLive.com from \$10 per user, per month; and Ubuntu, an open platform for netbooks, laptops, desktops, and servers.

The IBM Client for Smart Work will only arrive in the U.S. in 2010 despite IBM positioning it to rival Windows 7 in the enterprise market. It will be available both as a run-of-the-mill desktop and as a virtualised desktop.



## Nokia releases official Qt port to Maemo 5

Nokia has announced the creation of the official Qt port to Maemo 5 and published an initial Technology Preview release. This port to Maemo 5 means that developers can now use Qt to target the upcoming Nokia N900 device, and also

ensures that applications can be easily ported to all Qt's supported platforms including

the next Maemo 6 release, as well as Symbian and Windows Mobile.

It is designed specifically to work within the Maemo 5 environment, which will power the Nokia N900 device. The port itself will be based on Qt's upcoming version 4.6 and is scheduled for release in Q1 of 2010. Visit [qt.nokia.com/maemo](http://qt.nokia.com/maemo) for details.



## Google joins Open Screen Project

Google has joined Adobe's Open Screen Project [[openscreenproject.org](http://openscreenproject.org)], an initiative established a year and a half ago to help developers design content more easily for the Web across multiple screens, using the Flash platform.

According to Google, "We've always believed that open platforms lead to greater innovation on the Web, and we see participating in the Open Screen Project as another step in that direction. We're excited to continue working with the teams at Adobe on pushing the Web forward, and to see where the next generation of Web development will take us."

The project includes close to 50 industry leaders working together to provide a consistent runtime environment across mobile phones, desktops and other consumer electronic devices.

## LF announces second annual End User Summit

The Linux Foundation has announced the speaker line-up and details for its second annual End User Summit. The Summit is a unique opportunity for corporate end users to learn and interact with leaders from within the Linux community. It will take place on November 9-10, 2009 at the Hyatt Jersey City on the Hudson (in New Jersey, USA). "In its second year, the Summit will facilitate collaboration among Linux community members who, until recently, did not have the opportunity to discuss, face-to-face, the most pressing new usage models and demands facing the Linux platform," said Jim Zemlin, executive director at The Linux Foundation. The Summit is sponsored by IBM and Intel and is by invitation only. To request for an invitation, please visit the Summit website [<http://events.linuxfoundation.org/events/end-user-summit>].

## Mickos to EU: Oracle's Sun takeover not 'anti-competitive'

MySQL's former CEO, Marten Mickos, is sending a heartfelt plea to the European Union to wave through Oracle's takeover of Sun Microsystems. Mickos left MySQL earlier this year—just over a year after Sun bought his open source database outfit—after apparently becoming frustrated with the bureaucracy at Sun. With Oracle's takeover of Sun—and the prospect of Larry Ellison killing Mickos' open source baby – industry watchers might have expected the deal to further fuel his ire. Instead, Mickos has written to the EU competition commissioner, Neelie Kroes, to say that while the EU was absolutely right to launch an investigation into the deal, it should give the takeover the 'OK' as quickly as possible. Every day the EU holds up the deal, he argues, actually reduces competition in the market as Sun's business withers, and investment in 'open source ventures' slows down.





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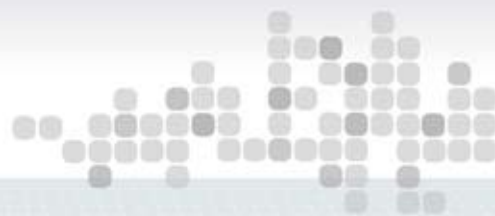
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## Red Hat gives open source perspective in Bilski case

Red Hat has filed an amicus brief with the US Supreme Court. In the brief, the company explains the practical problems of software patents to developers. The brief, filed in the Bilski case, asks the Supreme Court to adopt the lower court's machine-or-transformation test and to make clear that it excludes software

from patentability. The Bilski case involves the standard for patenting a process. The case concerns a business method patent, but involves many of the same issues as software patents. "Red Hat continues its commitment to the free and open source software community by taking a strong position against bad software patents," said Rob Tiller, vice president and assistant general counsel, IP for Red Hat. "Our patent

system is supposed to foster innovation, but for open source and software in general, it does the opposite. Software patents form a minefield that slows and discourages software innovation. The Bilski case presents a great opportunity for the Supreme Court to rectify this problem."



## Ingres 9.3 offers easy migration from other databases

Ingres Corporation has launched Ingres Database 9.3 that offers easy migration from MySQL, as well as from proprietary databases such as Oracle, MS SQL Server, and Sybase. In this release, Ingres adds features commonly used in applications written for MySQL and Oracle to enable a smooth migration to Ingres. These features include improved accessibility of table procedures from within the query and the support of positional parameter notations that make database procedure invocation more flexible.

Ingres Database 9.3 also provides support for PAM, which enables the database to support more authentication mechanisms than previous versions. The new version adds the ability to automatically start multiple Data Access Servers to improve scalability in environments where large numbers of .Net and JDBC applications are connecting to Ingres. Ingres Database 9.3 is available for download at <http://esd.ingres.com>.

## Digital Waves introduces T-Platforms' HPC Solutions

Bangalore-based IT solutions company Digital Waves and Russian supercomputer firm T-Platforms have inked a deal to "jointly offer high-performance computational clustering solutions to the Indian market." The new products available in India include the blade systems T-Blade 1.1 and T-Blade 2.0, PeakCell S server based on 9-core PowerXCell processors, and ClusterX software for high-performance computing systems. The T-Blade 1.1 system chassis incorporates the computing power of 20 quad-core Intel Xeon 55xx ('Nehalem') or six-core AMD Opteron 24xx ('Istanbul') processors in a compact 5U enclosure, to give up to 9.98 TFlops of peak performance in a standard 42U rack. T-Blade 2.0 is the second generation of T-Platforms blade

platforms designed for building compute systems with a Petascale level of performance. It provides peak performance of up to 3TFlops in a 7U enclosure and up to 18TFlops in a standard 42U rack. The PeakCell S server is based on the PowerXCell 8i 9-core processor. The server has a peak performance of 204.8 GFlops for double precision operations and 409.6 GFlops for single precision operations, packed in a convenient 1U form factor.



## Developing employee-savvy software gets Om Logistics Peace Award

World Without Wars has awarded S K Goel, vice president, IT, Om Logistics Ltd, with the inaugural Peace Award for promoting technologies that struggle against violence (monopolies). Goel has been conferred this award for developing Linux software and making it employee savvy. The World March, initiated by World Without Wars—an international organisation launched by the Humanist Movement—began in New Zealand on October 2, 2009. It will conclude in the Andes Mountains (Punta de Vacas, Aconcagua, Argentina) on January 2, 2010, after covering more than 90 countries around the globe.

## MIPS joins Open Handset Alliance

MIPS Technologies, a provider of processor architectures and cores, has announced that it has joined the Open Handset Alliance, a group of more than 45 technology and mobile companies working to offer consumers a richer, less expensive, and better mobile experience. As a member, MIPS Technologies will work with others to contribute to the continued development and success of the Android platform. It's already an active contributor to Android development, recently making its source code optimised for the MIPS architecture, publicly available. As part of its relationship with the Open Handset Alliance, MIPS will contribute the 'Android on MIPS' code to the Android Open Source Project.



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## New open source router from NETGEAR

NETGEAR has launched the RangeMax Wireless-N Gigabit Router with USB, which is also designed to serve as an open source Linux platform supporting a wide variety of applications. The open source Linux-based firmware—DD-WRT, OpenWRT and Tomato—are also available on the WNR3500L router, making it easier for users to develop a wide variety of applications.

RangeMax Wireless-N Gigabit Router with USB features a 480MHz MIPS 74K CPU core with embedded hardware acceleration and incorporates 8 MB of Flash memory and 64 MB of RAM. It features five 10/100/1000 (one WAN port and four LAN) Ethernet ports with auto-sensing technology, with WAN to LAN speeds in excess of 350 MBps.

## Host of new features in Parsix GNU/Linux 3.0

A new version of Parsix GNU/Linux has been released in October.

Version 3.0, a.k.a 'Kev', brings a vast number of new features like: GNOME 2.26.3, kernel 2.6.29.6 with extra patches and drivers, ext4 FS and GRUB 2, AuFS and UnionFS support, SquashFS+LZMA compression for live-CD and lots of

updated packages like GNU Iceweasel 3.5.3, OpenOffice.org 3.1.1, Compiz-Fusion 0.8.2, etc. Due to vast number of changes and new default features in

this version, the project has been recommended for a CD-ROM update mode installation. To know more about Parsix, visit [parsix.org](http://parsix.org).



## Acer launches Liquid, with the Snapdragon processor

Finally, Acer has also come out with an Android phone that's based on Qualcomm's Snapdragon processor. It's been christened Acer Liquid. Liquid's bells and whistles include a WVGA touchscreen, Android 1.6, HSPA 3G, along with Wi-fi, GPS, Bluetooth and a 5 mega-pixel camera.

The latest Android kid on the block is reported to feature improved power management, a camera with geo-tagging, ISO, self-timer options, and accelerated auto-focus. And of course, keeping pace with the latest trends, it will also support multimedia, Web browsing, social media integration and video streaming. Liquid will sport a completely revamped user interface, atop Android 1.6. The UI also debuts 'Spinlets'—apps for streaming music and video that can be shared via Web-posting and e-mails. Unfortunately, the pricing has not been announced yet.



## RH, MS expand virtualisation interoperability options

Red Hat has announced that customers can now deploy fully-supported virtualisation environments that combine Microsoft Windows Server and Red Hat Enterprise Linux. In response to customer demand for interoperability in their IT environments, Red Hat and Microsoft have completed testing and validation for mutual customers using server virtualisation. Joint support for these configurations from Red Hat and Microsoft is available now.

Customers can now deploy tested and supported virtualised Red Hat and Microsoft solutions. The completed certifications include: validation of Red Hat Enterprise Linux 5.4, using the KVM hypervisor, with Windows Server 2003, 2008 and Windows Server 2008 R2 guests; and certification of Windows Server 2008 Hyper-V, Microsoft Hyper-V Server 2008, Windows Server 2008 R2 Hyper-V and the Microsoft Hyper-V Server 2008 R2 host with Red Hat Enterprise Linux 5.2, 5.3 and 5.4 guests.

Additionally, Microsoft products certified on Windows Server and Red Hat products certified on Red Hat Enterprise Linux are also supported in these heterogeneous virtualised environments.

## IDA official Indian distributor of Beagle Board and NanoNote

IDA Systems is now the official India distributor of the Beagle Board platform. The Beagle Board is a low-cost, fan-less single-board computer based on Texas Instruments' OMAP35x processors featuring the ARM Cortex-A8 core with all of the expandability of today's desktop machines, but without the bulk, expense or noise. The Beagle Board (C3) is priced at Rs 8,999.

In addition, IDA Systems is now bringing to India the 'copy left' ideology-based NanoNote mini computer. The Ben NanoNote is a small form-factor computing device. It sports a 336 MHz processor, 2GB of Flash memory, a microSD slot, a head phone jack, a USB device and 850mAh Li-ion battery. It boots Linux out of the box and also boots over USB. It's targeted at developers who see the promise of open hardware. The Ben NanoNote is priced at Rs 9,000. For pre-orders till November end 2009, it can be availed for Rs 6,000.



“I wanna be  
*your* **HERO**  
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says HTC Sense!



HTC Hero continues to maintain HTC's leadership in cutting-edge design. It introduces a more natural way for you to reach out to people as well as access all your important information, by following how you communicate and live your life. HTC Sense is a distinct experience created to make HTC phones simpler to use, leaving users saying, "It just makes sense!"



There was excitement in the air, tension around the Adam's apple. iPhone had already swept the touch-screen market with its brand-new OS, zippy UI and the Safari browser that could turn every website into a sex bomb. Microsoft got another jolt when Google decided to take up the Linux kernel and build a mobile OS on top. And then HTC launched the G1. Alas! Nobody seemed to be interested in paying \$699 for a phone that ran an open source OS and depended on freelance developers for the apps. Neither could HTC themselves justify the price.

It was through this dynamic time that HTC also launched its most popular touch-screen brand, one version after another. First there was HTC Touch, followed by the Touch Diamond, Touch Pro, Diamond HD and many

more. What made these phones popular was their proprietary TouchFlo user interface. When HTC's other Android-based phones, the G2 and Magic, also got a lukewarm response, it decided to fuse its award-winning combination with Android, and thus was born the HTC Sense.

## HTC Sense

HTC Sense is a user experience that's based on the TouchFlo 3D user interface, developed by HTC for mobile devices running Google Android. The Sense 'experience' is not, as it has often been described, a UI as such. Sense is just a "...design experience, an architecture that is all about how people use the device, making their content personal to how they use the device." HTC Hero is the first phone that shipped with HTC Sense. With its distinct design and powerful capabilities fully integrated with Sense, Hero introduces a unique blend of form and function that takes Android to new heights. HTC Sense is focused on putting people at the centre, by making your phone work in a more simple and natural way.

## The Hero

It was written that a great Hero would rise from the East. He would be clothed in the sun and his unique user-interface would redefine the user experience for countless fans of social networking, and His Majesty would reign over all Android phones forever. That Hero is here, and he's on Airtel.

The phone was launched in September 2009, in India. It is the first Android device to support Adobe Flash, is HTC's first phone that's available worldwide, and is the first Android phone to host HTC's proprietary software, the widgets, add-ons and TouchFlo 3D elements. Smartphone fans seem to agree that the company



Figure 2: The Rear Side

has finally delivered what has been missing in the world of Android, namely, a polished and attractive device (polished enough to go head-to-head with the iPhone) with an open source heart.

## "What's in the box?"

We received the Hero in a white rectangular box that contained the following:

- The HTC Hero
- A 1350 mAh battery
- A 128 MB Micro SD memory card
- A data cable that can be transformed into a ninja charger (*ala* the Auto Bots and Decepticons).

## Form factor

The very moment you lay your eyes on the phone, you know that it's a product of sheer evolution. While all the HTC Android phones are designed the same, the sleek curve (known as 'the chin') right at the bottom seems to be an ergonomic, inviting design. No other mobile manufacturing company offers such quirky contours.

Housed on the front is the earpiece, covered by a fine grill. Right next to it is the service LED (glows red when the phone is being charged or is connected to a PC, and green when the battery is fully charged) and ambient light sensor that handles the display's backlight. Hero is the first phone that has a fused curved casing, almost-invisible volume rocker, trackball, touch-screen and matte plastic all at the same time. The bevelled edges along the back makes the handset sit comfortably in the hand.

The plastic material that covers it



Figure 1: HTC Sense—enhanced Android experience



## Specifications

Processor	Qualcomm MSM7200A, 528 MHz
Operating system	Android
Memory	512 MB (ROM) 288 MB (RAM)
Dimensions	112 x 56.2 x 14.35 mm (4.41 x 2.21 x 0.57 inches)
Weight	135 grams (with battery)
Display	3.2-inch TFT-LCD capacitive touch-sensitive screen with 320x480 HVGA resolution
User interface	HTC Sense
Input method	Multi-touch screen, trackball
Network	<ul style="list-style-type: none"> <li>HSPA/WCDMA - 900/2100 MHz (upto 2 Mbps up-link and 7.2 Mbps down-link speeds)</li> <li>Quad-band GSM/GPRS/EDGE (850/900/1800/1900 MHz)</li> </ul>
Device Control	<ul style="list-style-type: none"> <li>Touch UI</li> <li>Trackball (for both navigation and selection)</li> </ul>
GPS	Internal GPS
Connectivity	<ul style="list-style-type: none"> <li>Bluetooth 2.0 with Enhanced Data Rate</li> <li>A2DP for wireless stereo headsets</li> <li>Wireless: IEEE 802.11 b/g</li> <li>GPRS (Class 10), EDGE (Class 10), HSDPA (7.2 Mbps)</li> <li>HTC ExtUSB (11-pin mini-USB 2.0 and audio jack in one)</li> <li>3.5 mm audio jack</li> </ul>
Camera	5.0 mega-pixel colour camera with auto (touch) focus
Audio formats	MP3, AAC(AAC, AAC+, AAC-LC), AMR-NB, WAV, MIDI
Video formats	MPEG-4, H.263, H.264 and Windows Media Video 9
Battery	Rechargeable Lithium-ion (1350 mAh)
Expansion slot	microSD memory card (SD 2.0 compatible)
Sensors	Accelerometers, Ambient light sensor
Browser	HTML
Notable features	<ul style="list-style-type: none"> <li>HTC Sense UI</li> <li>G-Sensor</li> <li>Digital compass</li> <li>Photo geo-tagging</li> <li>Dedicated search key</li> <li>HTC Sense quick profile switcher</li> </ul>

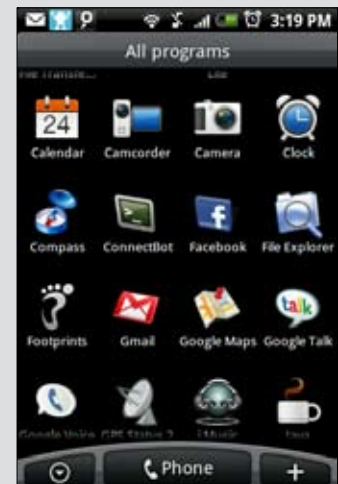
is extremely smooth, elegant and not prone to wear and tear, smudges and finger prints. The memory card socket (microSD and microSDHC) is found on the left-hand side, but in order to swap cards you'll need to remove the back cover first. Thankfully, though, you won't have to turn the Hero off. The SIM-card bed is located right under the battery and utilises a couple of runners for holding the card. There is also a lanyard eyelet located right on the battery cover.

## Controls

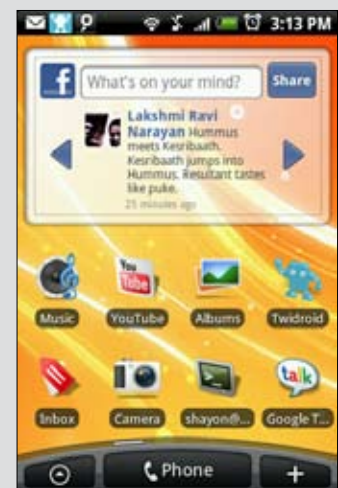
The very first set of buttons that will catch your fancy are the little oval ones right on Hero's chin. They are *Call/Send*, *Home* (brings up the task manager if kept pressed), *Menu* and *End*. Below them reside the *Search* and *Back* buttons. There is also a trackball used to jump between the UI's screens, applications, and to scroll through pages, text and the browser's screen. It is very helpful when one needs to click on Web



▲ The Home screen



▲ Menu Structure



▲ Facebook Widget - alongwith shortcuts to various apps



▲ The Dial screen, with call history



▲ Add a new contact



▲ The Facebook App



Figure 3: 5 megapixel camera - without flash



Figure 4: Volume rocker is intelligently fused in the phone's design

links written in minute fonts and spaced too close together.

The dedicated search button mostly brings out Google Search. However, in some apps, it launches HTC's inherent search box. At the top, there is a 3.5 mm jack for audio, and a slot to open the battery cover. The bottom exhibits HTC's trademark ExtUSB socket, for charging and data transfer, along with the microphone. The volume rocker is to the left of the phone. It is very slim and mounted flush with the casing. One good thing is that like the WinMo devices, the volume rocker can be used even when the phone's locked. This is useful since it enables you to change the volume level without having to take it out of your jacket pocket, for instance. However, since the rocker is at the same level with the case, it does become tough to locate, at times.

Sadly, Hero has no dedicated camera button. The camera needs to be accessed from an internal menu and the trackball doubles up as the shutter button. There is also a separate zoom menu. However, you are advised not to use it since it is only a digital



Figure 5: The SD card slot is inside the battery cover



Figure 6: Pretty powerful speaker - with the LED

zoom and can be achieved using any photo editing software.

There are no slots or buttons on the right.

## Display

The display of Hero is a 3.2-inch capacitive TFT screen (68x45mm) with 480 x 320 pixel resolution (HVGA). The screen uses a new oleophobic treatment (similar to the iPhone 3GS), to make it more touch sensitive and smudge resistant. Unfortunately, the screen is a finger print magnet and you will find yourself rubbing it with your handkerchief pretty often.

The screen has a wide viewing angle, with hardly any distortion. While the colours are very bright, it gets washed out under direct sunlight. It is also very responsive to touch, although still a bit behind the legendary iPhone. However, we must keep in mind that Android is typically designed for resistive displays that are more suited to a stylus. Yet, the OS has come a long way in the world of finger-touch.

## Camera

This monster has a 5 mega-pixel camera with auto-focus. It is placed at the top part of the rear side. While the photo shots are really great in

## 10

## Great Apps from the Android Market Place

- **Twidroid:** This is the best Twitter and identi.ca application available on the Android Market Place. It doesn't just let you update your status messages and reply to others, but also allows you to visit their profiles, follow and unfollow them, upload images to the image service of your choice, and even customise notifications for new tweets, replies and direct messages.



The Twitter App

- **iMusic:** No doubt, this is the most popular application on the Market Place! iMusic allows you to get connected to the Gnutella file sharing network and actually download videos, images and songs right onto your Android phone!
- **PicMe:** While Android does not have an inherent screenshot-taking app, the developers have come out with a wonderful application that allows you to take screenshots of the mobile, remotely. All the phone needs is to be connected to a wireless network and the screenshot can be taken by any computer logged onto the same network. Since HTC Hero does not have any physical keyboard, there are no keyboard shortcuts and this seems to be the best way of taking a screenshot.



Take screenshots via local

- **Netmeter:** Not many service providers in India offer unlimited data transfer plans, these days. So, Netmeter is a great app to keep an eye on the amount of data you have already transferred on your network. It gives separate stats for mobile network traffic and wireless traffic. What's more, it will also point out the CPU load utilised by each of the processes running on your phone, so that you can identify the ones gorging on the bandwidth and take appropriate action.



Stay updated on your data usage

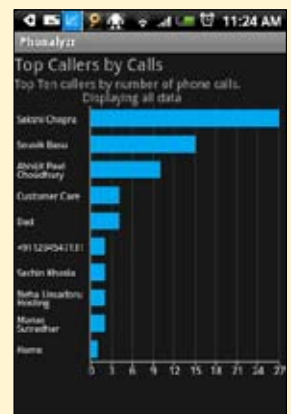
- **Bluetooth File Transfer:** While HTC Hero does not allow transfer of media files using Bluetooth, this app will help you do so. However, it uses a different port (port 29) to communicate using the Bluetooth protocol.

- **Qik:** This application has been very 'qik' to pick up steam and become one of the leading services in live video blogging. All you need to do is install the app on your mobile, fire it up, and keep shooting videos of events. The videos will automatically get streamed, live, via Qik's network, using your mobile service provider's bandwidth. While you will need 3G for the streaming to be seamless, it works very smoothly on a broadband wireless network.



Live stream video for the world to see

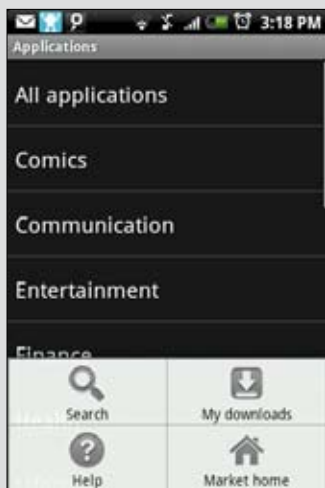
- **ConnectBot:** This application will make every Linux enthusiast roar in unison, "I am the power of the Universe!" ConnectBot actually lets you connect to other machines in your network, using ftp or ssh, and then presents you with a console screen for you to play around. Awesome app, we say!
- **StumbleVideo:** While the default YouTube application is more than capable of streaming videos, StumbleVideo adds the spice of StumbleUpon to it. Yes, you can actually stumble videos on your Android phone, thumbs-up a video or just keep discovering new ones.
- **Phonalyzer:** More than being useful, this is one of the most amusing mobile phone apps I have ever witnessed. It simply sits in the background and keeps accumulating statistics about your phone usage. Then, it presents you with the information, in the form of interesting graphs, like 'Top Callers by Minutes', 'Top Callers by Calls', 'Missed vs Regular Calls', 'Call Length Distribution', etc.



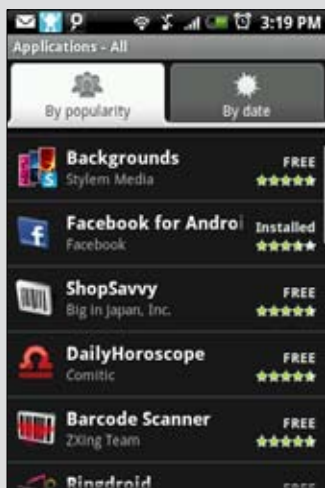
Analyses your calling habits

- **Compass:** While this is primarily a fun app, it has the potential to turn into something very useful if you are one of those who often get off the beaten track. What helps the phone navigate are the extra-sensitive accelerometers housed within it.





▲ Android Market Place



▲ Various applications at the Market Place



▲ Twidroid - Best Twitter app for Android

sunlight, it is pretty useless under low lighting conditions, thanks to the lack of a flash and low sensitivity. Moreover, the camera lens has no cover glass, thus making the lens slot a deadly magnet for dust.

## Battery

Personally, for an Internet junkie like me, 1350mAh of juice is too little to even last a day. After about 30 minutes of YouTube, 30 Twitter updates, 10 FB updates, around 60 minutes of phone calls, 50 e-mail messages, 10 camera shots and 10 hours of Wi-Fi, the phone hardly lasted 20 hours. Ideally, I would have liked it to last for a minimum of 30 hours. However, the fact that I can charge the phone using the USB cord, never made me cry for battery power.

## Performance

HTC Hero has a Qualcomm processor that causes the graphic transitions to stutter a bit and results in screen rotations that feel dangerously uncomfortable. Yet, we found the Hero to be stable, and it rarely hung or crashed. But the occasional lag could get annoying when you're using the phone every day. Moreover, the OS still seems to be a little unstable and asks us to force the closure of a certain *htc.android.provider* task quite frequently.

## User experience

It is the home screen of HTC Hero that is unique among phones. There are seven home screens that you

can swap with the swipe of a finger, and you can add a range of widgets and shortcuts, as well as customise the wallpaper. This feature definitely gives you the feel of using multiple desktops on your computer.

The widgets make life so much more exciting with HTC Hero. While the widgets are homologous to Android, there are a host of them developed by HTC. What's more, if you find yourself limited, you can always browse at Android's Market Place and choose between thousands of free apps to download and use.

Surfing the Web on the Hero is a pleasure. Thanks to its accurate browser, which includes Flash support, you won't miss a single whizzy ad. Moreover, the multi-touch capability of the capacitive screen helps you zoom in and out of the Web pages, images and text really fast.

We also loved the 'Mount' feature of the phone that allows you to use the mobile's memory card as a USB drive.

## Social network in your pants!

Hero is very tightly integrated with your Gmail, Facebook and Twitter contacts and makes sure you never miss 'updates' from your friends. The customised OS also pulls in your Facebook and Flickr photo albums and shows them alongside your contacts' info. If you click on a contact, it lists out not just the phone numbers, addresses and birthdays but also your friend's photos and updates on Twitter, Facebook and Flickr.



Figure 7: The innards of HTC Hero - in its full glory

## Why should I buy the HTC Hero?

1. It's got the heart of Linux! Yes, Android being open source, there will never be a dearth of third-party applications to power the phone.
2. The Sense UI and the touch-screen QWERTY keyboard are the best in the business.
3. The hardware design is very risqué and succeeds in catching a lot of attention (a la 'the chin').
4. Android's default browser (it's not Chrome, at least not yet) is based on Webkit, is dizzying fast and renders Web pages in a very customised and easy-to-use layout.
5. Tight integration with Google accounts makes sure you carry your information everywhere you go, be it the calendar entries, contacts, tasks list or even the RSS feeds.

## Should I give HTC Hero a pass?

1. Although it has a 5 mega-pixel camera, the shutter is extremely slow and highly sensitive. Moreover, the absence of a flash renders the powerful camera absolutely useless.
2. While the operating system is open source and most of the applications are developed by freelance developers, this phone can hardly justify its price tag.
3. The display gets washed out under direct sunlight.
4. It has no radio and no proximity sensor to switch off the display once the phone is near the ear.
5. The GPS takes a long time to get a satellite lock.

Whether HTC plans to support other social networks too, isn't clear as yet.

## Text input

HTC Hero has an on-screen keyboard with different layouts—the traditional phone keypad, Compact QWERTY and QWERTY. It has a simulated haptic-forced feedback every time you hit a key. HTC has built its own touch keyboard from the ground up. The keyboard also has a text prediction algorithm that is almost 98 per cent accurate in daily use and 100 per cent accurate if you type only English words.

However, it is advisable to run through the training mode to help it learn your particular tapping quirks. It's probably the best touchscreen typing experience I've ever encountered. It never lags behind. I am a BlackBerry addict myself and yet, Hero did not make me miss BB's physical keyboard. The good news is: Hero supports the cut-copy-paste drill too.

On the whole, HTC Hero is a phone for both casual and business users. Since it gets synced to MS Exchange Server too, getting your e-mails will never be an issue. It is also one of the very few phones that support 'over the air' updates. The music player is also very competent, unless compared to the iPhone or Sony's Walkman Series phones. The touch UI is very snappy. However, what takes the cake is its strong integration with social networks, intuitive user interface and extremely rich Market Place that houses any app that one might ever need.

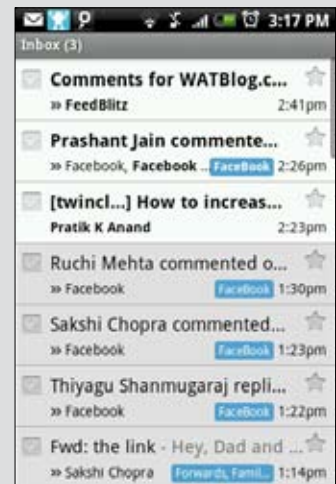
However, a price tag of Rs 32,000 (Rs 35,000 in Maharashtra) is a bit too steep for the Indian market. If it ever drops to the range of Rs 25,000-Rs 28,000, it should be the ideal phone to buy! **END!**

By: Sayantan Pal

An avid Twitter user and a social media enthusiast, the author is a passionate blogger and a professional gamer too. He also feels compelled to be opinionated about anything that comes his way, be it Linux distributions, our marketing strategies, table etiquettes or even the fabled Ramsay movies!



▲ Teeter - A fun game that uses Hero's extra-sensitive accelerometers



▲ The Gmail App for Android



▲ GTalk for Android



# Super, Simple

# Security

Here're some easy-to-use security tips and tools that can give you that peace of mind.

*S*ecurity and privacy are two things about which everyone—from netbook owners to server administrators—is concerned.

After all, it is one of the main reasons why people switch over to Linux and other FLOSS software. But once they do switch over, they find it to be a very daunting task to actually get started with encrypting hard drive partitions, ensuring privacy, etc. Many people are scared of the terminal, the cryptic commands and the terminology that they need to get familiar with in order to secure themselves.

Well, if you are new to all this, relax. In this article we will look at ways of securely performing some of the most common tasks on our computers; and do so in a very simple and user-friendly manner.

## Home directory encryption

Most of you probably know about the possibility of encrypting your data to make it secure. But I'm sure only a few of you might actually use this feature on your system. The main reason for this might be the lack of know-how or the negative impact on performance due to encryption and decryption of the entire system.

The recently-released Ubuntu 9.10, Karmic Koala, solves both these problems with a very nifty feature—a per-user home directory encryption. While home directory encryption was present in the past few versions of Ubuntu, it was never this simple to set up. This feature uses the eCryptfs cryptographic filesystem. The fact that the encryption is done only for the home directory and not the entire filesystem, means that it encrypts the data that is most important to you, while causing minimum degradation in performance. Some estimate the performance loss to be around 5 per cent.

How it works is extremely simple. You can set it up during installation from the GUI installer itself. Figure 1 shows the steps in the installation process. Once set up, whenever we boot the computer and log in, the directory is unlocked and we can use it just as we would normally use our home directory. It must also be noted that if you enable home directory encryption, then encrypted swap is also set up from this release onwards.

Now, some of you might be wondering how secure this encryption really is. Well, Dustin Kirkland (who developed this feature) says that while this might not be the best



solution to secure national secrets, it's mainly intended to prevent criminals from getting access to, say, your credit card information off your stolen laptop. So having this feature in the age of portable devices like netbooks, MIDs, etc, is certainly a huge boon.

## IM conversation encryption

Most of us use instant messaging clients these days. We usually only chat with friends and relatives, so we don't realise the need to secure and encrypt our instant messages. But as the saying goes, "Better safe than sorry." So we should take steps to secure our IM chats—at least the somewhat-important conversations. And this is where OTR comes into the picture.

OTR (Off-the-Record) messaging helps us encrypt our conversations in a very simple manner. While it does provide most of the features offered by other similar protocols, like authentication and encryption, what makes it stand out is deniability. In fact, one of the primary goals behind OTR was to have deniability, much like in real-life conversations. So if you use OTR, the messages sent by you have no digital signature. Hence, someone can forge the identity of anyone else, once the conversation is over. You can deny your participation in the conversation. But when the conversation is on, we can be sure of the other person's identity. Another reason why OTR shines is that it is not tied to any single protocol. It's just that the users on both the ends must have clients that support OTR.




Many IM clients support OTR, either natively or by using a plug-in. On Linux, both our favourite IM clients, Pidgin and Kopete, support OTR. To use OTR in Pidgin, enable the 'Off-the-Record Messaging' plug-in under *Tools→Plugins*. Then, in its configuration menu, click 'Generate for each account' along with which OTR is to be used. Then open a chat window using the account on which OTR is enabled. A new option will be available in the window as shown in Figure 2. Here, we can choose whether we want to set the conversation to 'Private' or not. And if the person on the other side also has OTR support, then we are all set to go.

Incidentally, developers of Empathy, which is now the default IM client in the latest versions of Ubuntu, Fedora and most other distributions, are not too impressed with OTR. They plan on implementing XMPP end-to-end encryption. Though an OTR implementation is also being worked upon, primarily to have compatibility with other OTR users.

## Internet browsing security

While these days, Internet surfing is probably the primary activity on our computing devices, we hardly ever take steps to protect our privacy and security on the Web. One of the first things that comes to mind when thinking about surfing with privacy, is the use of proxy servers.

Some of the proxy servers do help in surfing the Web securely and, to some extent, anonymously. But the main problem with using these kinds of proxy servers is that they

MICROPROCESSOR BASED BATTERY-CHARGER HEALTH MONITORS-AC/DC MODEL	MICROPROCESSOR BASED CHARGER SENSOR UNIT	BATTERY LIFE ENHANCER
 <p>Buzzer</p> <p>TO SENSOR UNIT</p> <p>Computer Interface</p> <p>AC POWER</p>		
<p><b>Sensor Units for Battery &amp; Chargers</b></p> <ul style="list-style-type: none"> <li>• Microprocessor Based</li> <li>• Senses failures of charges in conjunction with sensor units.</li> <li>• Displays working of transformer along with output voltage</li> <li>• Displays working of Battery with voltage</li> <li>• Audio-visual alarm in case of failures of A/C Voltage failure as well as low/high battery voltage.</li> <li>• Different sensors of different voltage can be connected to same console</li> <li>• Computer port for attaching computer for data downloading</li> <li>• Input Voltage AC 110/220 or DC 12V Power supply based</li> <li>• Current draw 75mA ± 10%</li> </ul>	<ul style="list-style-type: none"> <li>• Microprocessor Based</li> <li>• Would be able to sense A/C failures in respect to A/C supply cable, step down transformer failure as well as fuse failure in A/C Circuits</li> <li>• Units available for 4V-6V-12-24-26-28-30-32-48-60—110 AC-DC Circuits</li> <li>• Dual LED Visual display for status</li> <li>• Unique alphanumeric 4 Digit I/D for each unit</li> <li>• I/D is programmable with ID Editor</li> </ul>	<p><b>Anti-sulphation device Increases Lead Acid Battery Life</b></p> <ul style="list-style-type: none"> <li>• Stops sulphation</li> <li>• Eliminates already existing sulphation</li> <li>• Increases battery lifetime by 200%</li> <li>• Reduces Electricity Bill as it keeps battery plates clean, which reduces recharge time</li> <li>• Helps protect the environment</li> </ul>
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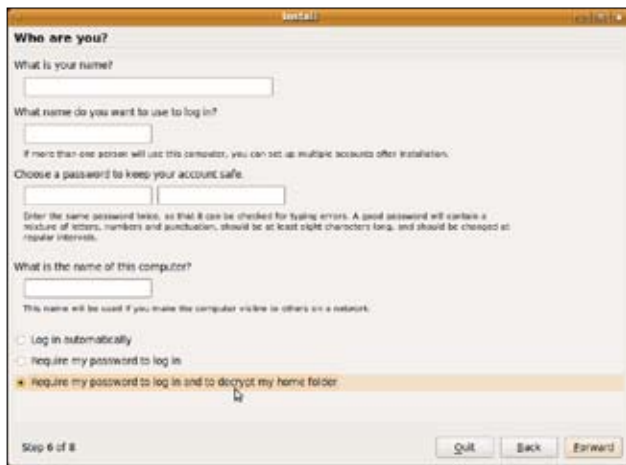


Figure 1: Setting a password to decrypt the home directory



Figure 2: Pidgin chat window with OTR enabled

often provide very slow connections, especially the free ones.

To overcome this problem, a Firefox plug-in called FoxyProxy is available. Essentially, FoxyProxy enables us to route certain sites through the proxy server, whereas the other sites will be loaded without using the proxy server. Hence,

the negative effect on our browsing is minimal. We can set up which proxy server is to be used for which sites, and governed by which rules, white lists, etc.

FoxyProxy is also used to access websites that are region-locked, for example, [www.hulu.com](http://www.hulu.com). One must remember that the level of anonymity gained in this process is essentially dependent on the proxy server that is used. While some proxy servers (mostly paid for) do offer complete anonymity, they are never really 100 per cent reliable. In fact, one of the most secure ways to surf is to use FoxyProxy along with the Tor network. The best method to set this up is explained on the FoxyProxy FAQ at <http://foxyproxy.mozdev.org/faq.html>.

Another aspect of browsing security involves surfing while leaving virtually no trace of the browsing activity on the client PC. The latest version of Firefox and Chrome both provide a 'Private Browsing' mode, using which no Web history, form history, or cookies are saved on the client machines—essentially, it tries to avoid leaving any traces of your Internet activity on the client machines. Available under the **Tools** menu in Firefox, this mode is very useful when you use the Internet for online banking and other e-commerce activities. One must remember that while surfing in this mode, it is possible that your ISP or any hacker can monitor the connection.

## Computer auto-locking

This is definitely one of the coolest ways to increase the security of your system. Usually, in large offices, employees lock their computers whenever they have to step out of their seats. Doing this again and again surely gets frustrating. But now, using software called BlueProximity, you can set your computer to automatically lock/unlock depending on your distance from the computer. You can do this if your computer is Bluetooth-enabled and you have a cell phone with Bluetooth capabilities.


Once BlueProximity is set up, it will automatically detect the approximate distance between the cell phone and the computer, and lock the screen once you move away. And when you come back near the computer, it gets unlocked. This software is really a boon for people who are tired of typing their passwords again and again. BlueProximity can also be set up to run any other shell command that you want. Hence, you can make it turn off the monitor, change the song that is playing or do just about anything that you can imagine.

## KeePass password safe

Anyone who knows a thing or two about security will agree that having the same password for multiple sites and applications is a *huge* security hazard. One of the main reasons why we use the same password everywhere is because it's too difficult to remember different passwords, while keeping them cryptic enough. So to overcome these problems, the best way is to use a password manager.

One of the best ones that I recommend is KeePass, a cross-platform, open source password manager. You can use it to store all the passwords in its database. Then you have to remember just the master password for KeePass and you can access all the other information.

The developers of KeePass have taken a lot of trouble to make it as secure as possible, employing various advanced algorithms. It is completely portable and can be used from a USB disk also. It even has features that can prevent a key logger from deciphering the passwords.

This just about sums up how to secure most of your common Internet-linked activities in a user-friendly manner. Anyone trying out these tips must remember that 100 per cent security is possible only in theory. There is no method that can give you complete security. But for most practical purposes, the methods suggested in this article should be good enough. If you too have any similar tips, do share them with us. **END** 

**By: Praveen Thirukonda**

The author is a third year computer engineering student who loves playing around with FLOSS. He is a huge sci-fi movie buff and also enjoys playing badminton.

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# Thirst for FOSS at the Job Market!

With FOSS growing by leaps and bounds because of the supportive IT landscape, there is a hard-to-quench thirst for FOSS experts. So don those FOSS training boots to climb higher up the career graph!

A decade ago, Novell Netware was a synonym for networks just like Windows was for operating systems. Expressions like “I have Netware, but I am not too sure of whether I have a network,” weren’t unheard of. It was a monopoly then. Today, FOSS/Linux has placed freedom of choice back into the hands of companies using technology. And the recent recession has helped to change the general perception about FOSS. The result is a heavy demand for FOSS experts from independent software vendors, SMEs, the government, and technology-oriented companies in the embedded device, mobile and netbook markets.

Elaborating on the demand for FOSS experts across India, Alok Srivastava, chairman, Network Nuts, a Delhi-based IT

training company, says: “During the last one year, I have seen tremendous growth in the number of people/companies coming for FOSS training. We have enrolled many who’ve been given a deadline of one month to get themselves trained on the Linux server because the company cannot afford to buy a Windows/Solaris box. The 50-55 per cent growth that the FOSS training sector saw last year speaks loud and clear of the growing demand for FOSS experts.”

## Advantage FOSS

But before taking the FOSS plunge, analysis of whether FOSS truly gives your career the much-needed push, is essential.

**Jaijit Bhattacharya, country director, government strategy, Sun Microsystems,** says: “Organisations are getting smarter



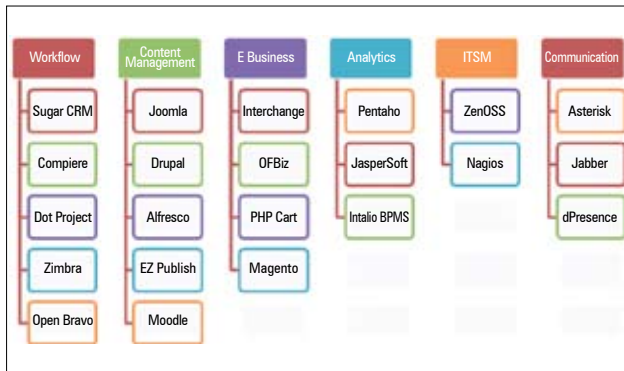


Figure 1: FOSS applications for which trained professionals are in demand  
[Courtesy: OSSCube]

by the day and will not spend unnecessarily on proprietary software when better quality FOSS is available and readily downloadable from the Internet. FOSS professionals will be the ones enabling organisations benefit from the cost savings provided."

Adding to this view, Rajesh Chhikara, director of the Institute of Open Source, and head of HR, EarlySail Software, says: "It's very simple—if you need to be different from the crowd then you have to learn technology that you have not learnt in college and the best way is to opt for open source technologies. Open source technologies guarantee that you leap ahead of the crowd."

With an increasing number of businesses lowering internal costs using FOSS, FOSS experts are sure to play an integral part in the process. "Trained and certified FOSS IT professionals can help the organisation take the right decision and this increases their chances to rise up the corporate ladder, faster," testifies Mitul Limbani, founder and CEO, Enterux Solutions.

Further, expertise in FOSS is bound to help you score over your proprietary software counterparts. "The 'thinking horizon' of a FOSS expert is wider than that of a proprietary software expert. FOSS experts deal with a lot of logical and environment compatibility challenges that makes them naturally more dynamic. Further, they are more proficient in building Web- and mobile-based applications than proprietary software experts," says Sonali Minocha, director, training, OSSCube. "The confidence to tweak and tune with the open source product gives FOSS experts a competitive edge over proprietary software experts as they can customise software as per one's need and at a cheaper cost," says Shankar Iyer, director, services, Red Hat. FOSS experts also have the benefit of support from a much larger online community for any problem that crops up.

## The skillsets in demand

Thus, every sector, whether it is Web development or product development; human resources, financial applications or charting analysis, is yearning for open

## Hungry kya, for FOSS experts?



The recession-led cutback on IT spends has given a huge boost to the demand for FOSS experts. That, coupled with changes in the IT landscape like independent software vendors drifting towards open source, SMEs plugging into FOSS sockets, and the reliance on FOSS in the embedded device, mobile and netbook space, has further fostered the hunger for FOSS experts. "Most SMEs, as well as major enterprises across the globe, have reduced IT spending during the recession. Further, clients have been asking the software development companies to develop the required solutions on open source," says Gopal S, CEO, Nace Solutions.

The embedded device space, especially related to mobiles and netbooks, has contributed to the demand for FOSS experts. "Acer uses the Moblin OS in its netbooks, so does BenQ's new S6 MID. There is a lot of FOSS development in the Blackberry area, like the GPS logger, which can help you log GPS plots every second. Now, open source Telnet/SSH clients are available for mobile devices also. This has resulted in the demand for professionals to be trained in open source technologies to help this industry make better products, cheaper and faster," explains Rajesh Chhikara, director of the Institute of Open Source, and head of HR, EarlySail Software.

Talking about other catalysts fuelling the demand for FOSS experts, Sonali Minocha, director, training, OSSCube, says: "Today, mobile and Web application technologies are heavily FOSS focused. The enterprise-class FOSS applications available in the market too are giving good competition to the proprietary software companies. Lastly, governments worldwide have passed legislations or given preference to open source, which has been a huge boost to FOSS."

The maturing FOSS industry, too, has contributed to the growth of FOSS and the subsequent demand for experts. "The increasing awareness of FOSS and better availability of systems administrators who have knowledge of FOSS, has led to more companies adopting it. This has caused a spurt in demand for FOSS experts," says J A Bhavsar, group head, ITM Business School. Adding to this, Satish Gopinath, proprietor, Integer Education, says: "There is a clear movement towards FOSS among the IT community. The movement has been fostered by a general maturing of FOSS products and the availability of support."

source experts. But for a smooth take off of your FOSS career, it is important to first have the skillsets in demand.

A FOSS professional can basically follow one of the following two paths—development or administration. "Professionals with expertise in security dataware housing, MySQL DBA and FOSS-based infrastructure management software; certified FOSS professionals, Zend Framework/Symfony Framework engineers, and Drupal developers



## Pick and choose your programme!

But how does one choose an appropriate programme. The key lies in choosing the right institute and course. Some of the options available are:

### Enterux Solutions

Enterux Solutions offers courses on Asterisk. The advanced five-day course for the more experienced Asterisk user will help the candidate learn to create advanced dial plans and create innovative telephony solutions by using the features of Asterisk. It is a combination of both lectures and lab work, designed to give students both the theory behind the concepts, and the hands-on experience to effectively deploy Asterisk-based solutions. Further details at: [www.enterux.com](http://www.enterux.com)

### Institute of Open Source

The mission of the Institute of Open Source is to make rare open source technologies reach all those who have an interest in software development. The institute offers courses in the PHP core, advanced JAVA and Perl, a basic and advanced course in Linux, different server configuration courses, a certificate course in Web administration and a certificate course in being a Web master. Further details at: [www.ios.net.in](http://www.ios.net.in)

### Integer Education

This is a global training services company, offering courses in Linux and PHP. There are two variants – basic training for freshers and advanced training for practising professionals. Further details at: [www.integereducation.com](http://www.integereducation.com)

### Lynus Academy

This institute offers courses in systems administration, tech support and DBA support. It provides training on RHCE, LPI (an international vendor-neutral Linux certificate), virtualisation, high availability clusters, troubleshooting, building secure Web applications, MySQL/PostgreSQL administration, etc. Further details at: [www.lynusacademy.com](http://www.lynusacademy.com)

### NACE Solutions

NACE Solutions provides open source consultation on migration and cost saving solutions, open source Web development and software training on Linux, Apache, MySQL, PHP, CSS, JavaScript, AJAX and Flex. The firm also provides training on Hibernate, Struts, Spring, and OpenOffice.org. It is the 'gold training' and solution provider partner for Novell. Further details at: <http://naceedu.com>

### Network NUTS

Established in 2003, Network NUTS is a Delhi-based IT training company that focuses solely on systems administrators and the security track of programs. Common available courses are RHCE, RHCSS, RHCA and virtualisation. The courses are available on a full-time and part-time basis and the duration varies from 32 to 100 hours. Further details at: [www.networknuts.net](http://www.networknuts.net)

### OSSCube

India's only Zend-authorized training partner and authorised MySQL education centre, OSSCube provides hands-on training on a number of open source software and technologies. It offers courses in MySQL, Zend, Sugar CRM, Symfony 1.2 and Doctrine, Ruby on Rails, and Python. Further details at: <http://osscube.com>

### Red Hat

Rated as the No 1 vendor in IT training by IDC, Red Hat offers performance-based training with hands-on, real world skills that IT professionals need to design, execute, and maintain successful open source infrastructures. It offers courses in systems administration, JBoss, and development. Further details at: [www.redhat.com/training](http://www.redhat.com/training)

are the kind of FOSS professionals in demand," says Minocha. Thus, LAMP (Linux, Apache, MySQL and PHP), LARM (Linux, Apache, Ruby on Rails and MySQL), JAVA, systems administrator courses like RHCE, SUSE; Asterisk for VOIP services, and JBOSS for application server are the beneficial skillsets to acquire.

### ...for Web development

A reputed freelancing site, Elance.com, claimed that PHP developers are the most in demand with approximately 600 projects on the site while Odesk, another freelancing site, put the number of active PHP projects at 1,487. PHP skillsets are red hot in the field of Web development. "Apart from PHP, a professional should have knowledge of CSS 2.0, JavaScript and HTML, and Linux in the area of Web development," says Chikkara.

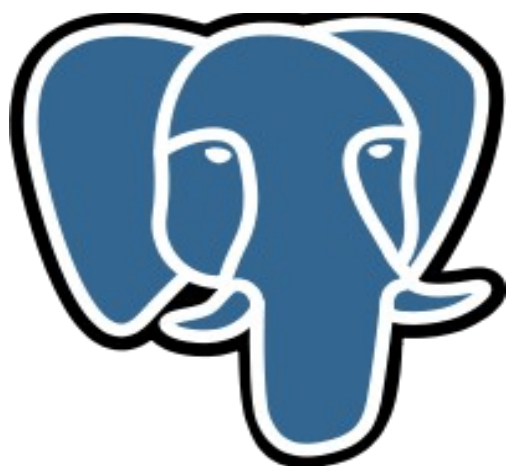
Gopal S, CEO, Nace Solutions, adds: "LAMP plays a major role in almost all Web development companies. There is an acute shortage of LAMP professionals across the globe, especially in India. LAMP has become more popular because of its scalable, low cost, more secure and great performance." The LAMP stack has moved beyond its position as a Web developer's creative toolkit and become a major development platform for the enterprise. Long a cornerstone of the Web's highest volume sites, including the likes of Amazon, Friendster and Google, LAMP has more recently been used to create major online transactional systems for Boeing, Disney, Lufthansa and Sabre.

### ...for systems administrators

The demand for FOSS systems administrators has also multiplied with the growth in the number of installations or applications on FOSS/Linux. The



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skillsets needed for systems administration can be divided into layers, says Srivastava. "The entry-level skill required by IT companies in the field of server administration and security is the Red Hat Certified Engineer (RHCE) level. Those who want to enter into the highly challenging area of network securities can acquire the Red Hat Certified Security Specialist (RHCS) certification. The top certification available in India under the administration and security bracket is Red Hat Certified Architect (RHCA). Those with a sound knowledge of virtualisation are also in demand," he adds. Red Hat offers three levels of training to FOSS experts. "Level 1 goes into the depth of systems administration. Level 2 involves acquiring networking and security skills while Level 3 goes deeper into understanding device issues," says Iyer.

Meanwhile, with 90 per cent of the BPO contact centres in India based on low-cost FOSS technology, skills in Asterisk are much sought after. "The future of business in BPOs depends upon reasonably priced technologies and equally priced expertise to help them manage operations. This has resulted in a demand for FOSS certified resources like Digium Certified Asterisk Professionals (dCAP)," says Limbani.

## The route to expertise

But how does one become a FOSS expert? Well, you first need to work on understanding hardware and FOSS on your own, then get trained and certified, after which you must keep abreast with new developments. "Start by downloading FOSS from the Internet and implementing it on a PC or laptop. Use the online community to get support initially. FOSS skills are acquired over a period of time and thus are in high demand," says Bhattacharya.

Thereafter, go in for a certified training programme. "A formal training in FOSS helps professionals sharpen FOSS skills, allowing them to use the tools in a holistic manner. Without the training, one tends to use only the modules one actually works on," says Satish Gopinath, proprietor, Integer Education. A. Saravanan, founder and director, Lynus Academy, says: "FOSS training provides the necessary knowledge and infuses confidence in professionals. It helps them to take on new and emerging technologies faster."

Once you have attained expertise in FOSS, you


## Formal training vs self learning

Self-learning, though hailed, is a very lengthy process as one has to totally depend on community support or look out for someone with knowledge in a particular FOSS domain. Formal training eases the learning process. Yet the debate goes on about the self-learning route vs formal training.

While Bhattacharya hails self-learning as a very good route to learning FOSS programming, as it helps overcome mental roadblocks and the diffidence to interact with larger communities, Limbani doubts the self-training mode, as the trainee loses out on learning about the various permutations and combinations that can be applied in a particular FOSS technology.

"Formal training provides you a mentor to look up to in case you are stuck in a particular problem, giving easy access to qualified resources. This helps you dodge the pitfalls in the deployment and service of a particular FOSS project. This results in an overall win-win situation for the professional, the enterprise and the FOSS project," says Limbani. "Nowadays, when cost is not the money but time, formal training helps the professional have time with his side. Formal training helps the candidate learn the tricks that the trainer would have mastered during a lifetime. Further, the edge of getting certifications and industry recognition, helps the candidate in getting a head start," adds Srivastava.


would need to build up the expertise in an open source product to build niche skills. "For example, your value would be more if you call yourself an expert in Magento and Drupal, than a PHP developer," says Minocha.

Looking ahead, with companies replacing previous proprietary solutions with FOSS alternatives, the demand for trained FOSS experts and the need for faster mechanisms to churn out FOSS professionals is only set to grow. So be quick to roll up your sleeves and get to work on FOSS!  **END**

By: Vanisha Joseph

The author loves to experiment and writing for LINUX For You is her latest experiment. So, beware! Just a minute, she also happens to be a journalist during the day.

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# Cricket

# GIMP for Beginners, Part 5



## 'Isolation'

Welcome to the fifth instalment of the GIMP tutorials. Here we will unravel the major functions of selection tools, with a particular focus on Isolation.

Isolation is the crucial tool part of image editing and is handy when you play around with an image. Each selection tool comes in use while isolating on different parts of an image. So what exactly is Isolation? Generally, it extracts/isolates a relevant part from an image for further use as another image. In this tutorial, we will be focusing on isolating images using various tools.

You should find the raw materials at [www.linuxforu.com/gimptutorial/part5.tar.gz](http://www.linuxforu.com/gimptutorial/part5.tar.gz), and experiment with them using the methods mentioned. To ease the learning process, we will go through every possible isolation, one by one, using different tools and methods. Thus, I have segregated the tutorial into different parts:

- Isolating using the Rectangle selection
- Isolating using the Ellipse selection
- Isolating using the Free/Lasso selection
- Isolating using the Path selection
- Isolating using the Fuzzy/Colour selection



**Note:** We generally use corresponding tools for the various shapes and natures. However, this doesn't limit us to use, experience, and experiment with other tools to isolate non-relevant shapes. For instance, we normally use the Rectangle and Ellipse selection to isolate rectangles/squares and ellipses, though the applications are not limited to them alone. We can always use the Lasso/Free selection tool or the Path tool to isolate a part, irrespective of its shape and nature. That's why Path tools are generally called the universal selection tool as we can realise almost all the other selection tools with it.

### Isolating images using the Rectangle/ Ellipse selection

Isolating images using the rectangular and the ellipse selection tools is the easiest of them all. In fact, authors writing for various technology magazines will find these tools a great boon. Isolating the relevant part increases the visible spectrum and thus makes the image more pronounced and



easy to view. So, if you want to show only a particular window, then you don't have to submit the full screen desktop. Instead, use the rectangular selection tool, isolate the requisite part and then submit the image. It's a very easy process and helps others to recognise what you want to show.

I have included some raw images to help you teach things easily by using the same image snippet I used. For rectangular isolating, grab the 'Rectangle Raw.png' image from the CD and open it in the Gimp. Our aim is to isolate the PTS window from the screenshot and make it look good as well.

After opening the image in the Gimp, grab the rectangular selection tool from the toolbox or press R. Create a rough selection as shown in Figure 1. Make sure that the Rounded corners option is enabled from the Tools option menu of the Rectangle selection. Now zoom in to erase minor selection defects and to gain the perfect isolation. As you can see, in Figure 1, the selection is bulging outside the requisite area. To make it perfect and professional-looking, we will remove the entire background except for the main window.

To make things look sleek, we can either reduce the selection or increase it, if the selection is deformed. The rectangular and ellipse selection tools provide editing corners from which you can manoeuvre the selection according to your needs. Just point the mouse to where the selection is deformed. You can then drag (increase/decrease) the selection by holding down the left mouse button and moving it up, down, left or right. If you don't have much control over the mouse, use the arrow keys to get precise results. Continue doing so for every part of the square, i.e., the PTS window.

Once you have a perfect selection, navigate to Edit → Copy. Then create a new template File → New. Notice that the Gimp automatically provides the resolution of the image that you are working on. So don't tinker with the



Figure 1: Rectangle Selection



Figure 2: Lasso tool in action

resolution, just create the template. Paste the selected portion using Edit → Paste. In our layer assignment (published in the August 2009 issue of LFY) we learnt about the transition of layers that are pasted. Currently, the pasted layer is in floating transition, and from here we have to decide the transition we want to set. Since we have opted to edit in a new template, we can shift the floating transition to a permanent new layer. To make your pasted image a permanent layer, simply select the Floating transition layer from the Layer Box and click on the Create a new layer icon. After that, the image pasted will be designated a new layer.

Notice that the whole image is bigger than the pasted part, so in order to create the image in the size of

the pasted part, we need to crop the undesired area. To do this, simply right-click on the newly pasted layer and select Alpha to Selection. Now navigate to Image → Crop to Selection and notice that the image is being cropped.

That's it! We have successfully isolated a rectangular portion. But if you save the image now, you will get a square cornered image. We had initially isolated using the Rounded Corner option; thus to save the image with rounded corners, just disable the Background layer by clicking on the eye and save it. If you want to add more pleasing effects, give a shadow to the image. Right click the pasted layer and select Alpha to Selection. Open the drop shadow wizard from Filters → Light and Shadow → Drop Shadow with values as 0, 30 and 100



for X, Y and Blur respectively.

Save the image and we are done with the first isolation process.

We could have skipped copy-pasting in a new template and instead opted for Crop to selection just after finishing the selection, but we didn't. This was because whenever you opt for the same method and save the image, you will never be able to get the rounded corners.



**Note:** The procedure of copying, pasting, cropping and providing a shadow to the selection in a new window will be used in every isolation method. So that makes it a universal method for all selections.

Isolating using the Ellipse selection is exactly the same. The only difference lies in the shape of the image. So, for circles, we use the Ellipse selection instead of the Rectangle selection.

## Isolating using the Free/Lasso selection

The Lasso tool or the Free hand selection tool (also known as the polygon selection tool) is a stripped down version of the Path tool. Yet, it can be as powerful as the Path tool at times, with its own strengths and benefits. It provides easier and smoother navigation all around, when compared to the Path tool. However, it does have its own oddities. You cannot recover the path once deleted. Also, editing the path that you have created isn't as easy as in the Path tool.

The Lasso tool is very efficient if you have mastered it and if you have quite a good control over the mouse. Lasso is just perfect for isolating a polygon selection and with the Gimp 2.6, the Freehand selection got refurbished and acquired the ability of the Polygon selection, using multiple clicks. Previously you had to complete the

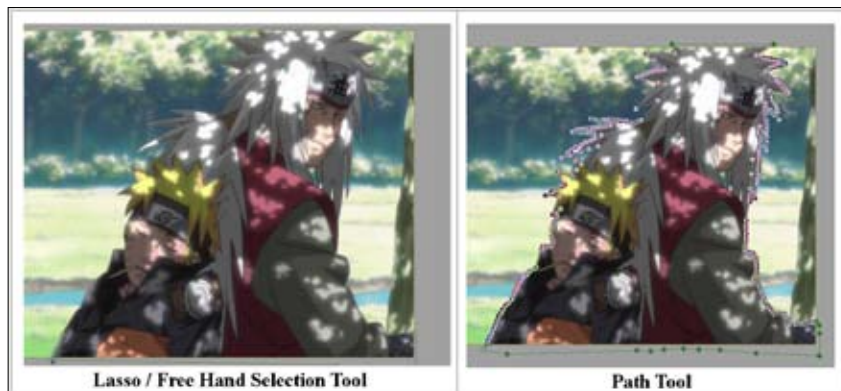


Figure 3: Difference between selections using Lasso and Path tools

selection in one go without leaving the left mouse button but now you are free to leave the mouse and complete the selection whenever you want. Working with the Lasso tool is almost identical to working with the Path tool so it will be easy to get a hang of the other, if you know the workings of any one of them.

To get started with the Lasso tool, grab the image Lasso Raw.png from the CD and open it in the Gimp. Select the lasso tool and start creating a selection from the bottom. To make the selection just click on the point from where you want to start and once you are done, a circle will appear. Move the mouse away from that point and you will notice a line stretching from that point onward; click again to create another lap. Continue doing it until you gain the shape you want to isolate.



**Tip:** You can make the selection process snappier by creating a significant distance between two laps. This trick comes handy when the selected part of the image has a straight section that needs to be outlined/isolated. However, when you select a curved section, keep the distance to a bare minimum—by doing this you get a very clean and smooth curved selection with less distortion.

You can start the selection from outside the image pane. As

already pointed out in the previous assignment, the Gimp selection tools will only select the part inside the image. Thus, if you have less space to work with, don't hesitate to exploit the boundaries.

So once you have opened the image, start from the boy, and then slowly and steadily form an outline. You can undo the step by pressing the backspace key; however, if you have some abnormality in the selection, just take your pointer towards the deformed part and the Gimp will display all the points/laps created with that particular region. Grab the point and holding down the left mouse button, move it to fix the misalignment. Continue with the selection and for long straight boundaries use decent gaps between the points. Join the end point with the starting point to complete the selection as show in Figure 2. Once you have completed the selection, the Gimp will frame the selected part in an active dotted line (Active Selection), and from there you can copy paste in a new template as discussed above.



**Selection Tip:** If, by chance, you missed removing or adding some part in the selection, revert to the original image and while pressing Shift (to add) or Ctrl (to remove), create a selection within the original selection. Once you are done, copy and paste to finalise the selection process.

## Isolating using the Path selection

Isolation using the Path selection is identical to that of the Lasso/Free hand selection tool. The only difference is that the movement of the path is a little rugged and stacked compared to the Lasso tool. On the other hand, the Path tool lets you restore the path using the path tab in the Layer Box.

The best and the worst part of the path tool is that it allows you to change/edit every point that you join to create the path. This sometimes turns out to be a headache. For example, suppose you are working with a complex image and have created many joints to complete the selection. And, by mistake, you messed up and forgot to join the points, yet you continued with the job. In this case, in the end, the selection will be incomplete and you will have to find the missing joint. Another plus for the path tool is that it's pretty easy to use and all the joints/points you create are visible right through the end.


## Isolating using the Fuzzy/Colour selection

The Fuzzy and Colour selections are not just another bunch of selection tools. Both of them are very efficient and offer quick results for isolating images. Both also have a pretty similar approach. The Colour selection is better than the Fuzzy selection, as the former offers a wide selection irrespective of layers, while the latter offers selections limited to the layer and colour tone.

Both these tools let you isolate images from a single toned background. If the background has multiple tones, then you can carry out the isolation steps a number of times, selecting different colour tones and then removing them. These tools come in handy while creating buttons, logos, etc, and if you want to turn an image background transparent. Since transparent backgrounds

offer more flexibility over coloured backgrounds, these tools come into play a lot.

For this assignment, open the Colour Select Raw.png image from the LFY CD and grab the Colour selection tool. Now select the background, which is white in this case. I have kept the background simple for quicker learning. Once the background is selected, head to *Colour → Colour to Alpha* and with default settings, click OK. Notice that the background is now transparent. You can always wipe away the remnants of colour near the border using the Blur tool. Save the image in png (Portable Network Graphics) and notice the difference. A transparent background image can be used anywhere while an image with a particular background colour will only look good when in the same colour region.

Fuzzy selection works in the same way but for smaller regions. We have already discussed the foreground selection tool in the third part of the series on the Gimp, published in the September issue. So that's it for now—we have covered almost every aspect of selection tools. We will be working with them throughout the series in a limited or in a sophisticated manner; but for now we are done with the selection. The next tutorial will be a bit of surprise; it could be related to something high definition or a wallpaper. I have included PTS with two windows (Multiple Rectangle Raw.png and the final output). Try getting that result using a tip hidden in this article. Do stay tuned, and do not forget to send in your queries and suggestions! **END** 

**By: Shashwat Pant**

The author is a FOSS/hardware enthusiast who likes to review software and tweak his hardware for optimum performance. He is interested in Python/Qt programming and is fond of benchmarking the latest Linux distros and software.

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# Experiencing Sabayon 5



oh!

Sabayon's strength has always been to showcase the power of FOSS on the desktop. Once upon a time, it used to come preinstalled with Linux-compatible games. But the current releases have done away with the idea of showcasing the games factor and concentrate on giving an out-of-the box desktop experience.

*S*abayon 5 (or Five oh!, as the project team likes to call it) came out on October 2, 2009. As has been the norm since the last couple of releases, it's been divided into a KDE and GNOME live DVD. The last version LFY had bundled was version Four oh! (we skipped 4.1 and 4.2). It was a single Live DVD that contained both GNOME and KDE. So what our CD team has done this time is combine the two separate ISOs into a single live multi-boot DVD. The downside is, you'll only get either of the two desktops, at a time.

The boot screen of the DVD gives you several options to boot the following: GNOME, KDE, a media centre desktop, UMPC, etc. I've only tried the first two.

Depending on your desktop of choice, you'll need to select one and proceed. The boot splash theme is, as always, black with a few coloured stripes with the Sabayon branding in the centre—not *that* great, but pretty smart and professional-looking, nonetheless. Well, the same image is also the default wallpaper in both GNOME and KDE. Coming back to the boot process, the live distro boot speed is comparable to other popular distros, and midway through the boot process, Sabayon starts playing a song that has something to do with "the rock and roll hall of fame."



**Note:** On my assembled AMD/NVIDIA system, without manual intervention, Sabayon booted to a 1024x768 px display—although it had detected and loaded the correct NVIDIA drivers. The easiest way to fix this is while you're on the boot screen – at the point when you select between the different boot



options, hit F4 and select the display resolution, there and then. On my Intel-based wide-screen laptop (which uses a resolution of 1200x800 pixels), things worked all right without any manual intervention.

## KDEExperience

Sabayon comes with a custom themed version of KDE 4.3.1 (v4.3.2 is not available in the software repository yet). Instead of the stock Air theme introduced in KDE 4.3, Sabayon uses Elegance—a dark theme that gels well with the overall Sabayon 5 look and feel. And unlike other distros, a number of other desktop themes are preinstalled to let you customise the desktop the way you want without requiring to download additional themes. Additionally, it comes with a decent collection of wallpapers too, and Kwin effects work out-of-the-box if you have a capable graphics card.

The resolution of panel is awkwardly set at a width of 1024px, leaving some blank space on both sides of a screen with a resolution of 1280x1024px (or, any resolution where the screen width is more than 1024px). Well, many not-so-mainstream distros have a fetish for this sort of a Mac OS X-ish panel setting, which sort of seems odd considering the fact that the rest of the screen on the left and right side of panel goes waste. Anyway, we all know how to set this straight, don't we? Strangely, essential shortcuts like 'Show Desktop' and 'Battery Indicator' (for laptop users) are missing from the panel. Again, we know how to take care of this.

While the stock KDE only has 'System Settings', a home directory shortcut for Dolphin and the Konqueror Web browser as our default 'favourites' in the Kickoff application launcher, Sabayon has added more natural fits for our favourites here (Firefox, Kopete, KTorrent, Konversation IRC client, Amarok, VLC Player, OOo Writer and Calc). However, I believe a home directory shortcut would have been a better selection instead of an IRC client; besides, 'System Settings' is also an essential app for those who like to tinker with their system frequently.

The default installation comes with lots of handy applications for most desktop requirements, but some of the essential apps like Digikam (digital camera tool) and the GIMP are missing. As for an image viewer/manager, Gwenview is also missing. So accessing images means opening them in the Okular document viewer. Of course, these can be had from the official software repository. In fact, although it comes with the Firefox 3.5 as the default browser, the repo also offers Chromium (open source Google Chrome) as an alternative.

After using Chromium for a week, I found it to be pretty stable. I'll definitely recommend it over FF simply because of the well-thought-out UI which gives you much more screen space to view Web pages, compared to any other browser, besides the ability to run multiple incognito windows (private browsing sessions). Coming back to FF (and even in Chromium), one good thing is that mime



Figure 1: KDE Live desktop

types are properly set. So you'll have no problem in directly opening e-mail attachments, or for that matter, when you download anything from the Web, straight inside the required application.

By the way, wireless connection on my Intel Wi-Fi based laptop worked out-of-the-box.

What I also noticed is the NetworkManager system tray widget has been cleaned up a lot. I don't remember seeing this polish when KDE 4.3 first came out. What struck me as surprising was the inclusion of the Wicd network manager—which is basically redundant!

Sabayon comes with most of the multimedia codes preinstalled. So whether you throw DVD videos at it or DivX files, VLC should be able to take care of it all. Amarok, on the other hand, takes care of your MP3 music collection. The version is 1.1.80 (2.2 beta)—the final 2.2 version is yet to be made available in the repo. Note that although this version reintroduces an equaliser, yet it's greyed out in Sabayon. Besides these two power apps, you also have the minimalist Dragon Player and the XBMC media centre application.

The version of OpenOffice.org is 3.1. It comes with an integrated Oxygen icon theme by default, which means better KDE integration because the icons don't look out of place in KDE4 any more. However, the KDE4 integration is nowhere near complete—the *Save as/Open file* dialogue boxes are still that of the stock OOo, instead of being KDE4 based. Apart from this, English spelling packs are missing. Another thing to note here is that font rendering inside OOo and Firefox are not anti-aliased out-of-the-box—which makes them look a bit crooked.



Figure 2: Default Kickoff favourites



Figure 3: Package categories in Sabayon installer

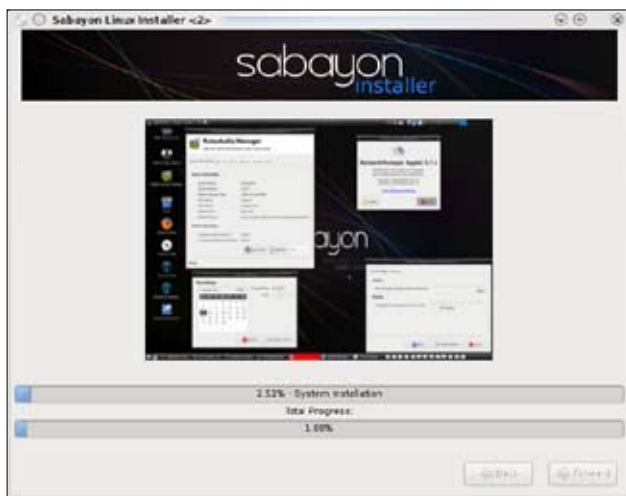


Figure 4: Installation in progress

## Install(xperience)

There's an 'Install on Disk' (live installer) shortcut right on the desktop. The installer is based on Anaconda, so Fedora users should feel right at home. The Sabayon version is customised to an extent to include some other choices. For example, the third screen gives you an option to choose between a KDE desktop (or GNOME, if you've booted into that DE), XBMC media centre or Fluxbox. The following screen gives you an option to select/deselect the broad software categories—office apps, Internet apps, multimedia apps, and basic free games. The next screen is where you'll enable/disable the following services: Samba, Cups, NFS, SSH.

Strangely, once you're done with the partition set-up, if your root is less than 8GB in size, the installer gives a warning. Ignoring it is a safe bet as, post installation, it only covers up around 4.2 GB of disk space. Probably this is a message that was introduced when Sabayon was a single bootable DVD consisting of both KDE and GNOME, but it doesn't make sense any more now that the ISOs have been split up.

Also, being based on the Anaconda installer, the Grub boot screen would only show the options of choosing

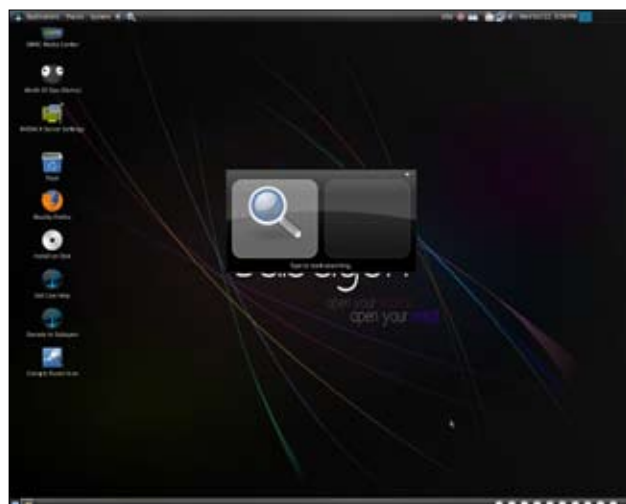


Figure 5: GNOME live desktop; GNOME Do in the centre

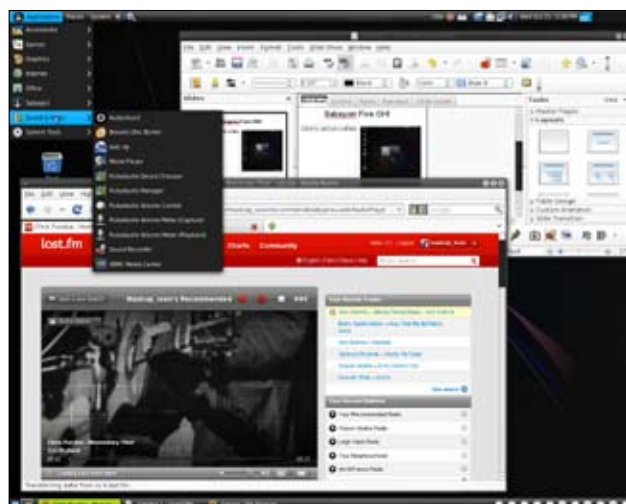


Figure 6: Enjoying last.fm in Firefox; F-Spot photo manager in the background

between Sabayon and 'Others'. However, post installation, when you reboot, you should see all your other distros on the boot screen—at least that's what happened in my case.

The final installation (file copying) process takes a while—around 10 to 15 minutes. And then you reboot!

## Package manage(xperience)

Now that you have the distro installed on your system, you'd obviously want to install the missing packages.

Sulfur as a package manager is really slow—every time you want to navigate to a new tab, you get a "Please wait ...take a break!" message. Additionally, it has a severely clumsy-looking UI, as if designed in the last century. Although the options are straightforward, they could become confusing when an application fails to install because of some error. Besides, buttons and options have been spread around multiple tabs, which makes using Sulfur awfully cumbersome. However, I've got to admit that the online repository has a decent collection of applications, and the mirrors are pretty fast.

An interesting point is that packages here have user ratings, which can be useful when you have to choose between multiple alternatives that serve the same purpose. However, note that the Sabayon user base is certainly not comparable to Ubuntu's to give you foolproof ratings. For example, Choqok is perhaps one of the best Twitter clients, yet it has got no ratings here. So, if you have a Sabayon online account, you might as well rate packages to make life easier for future users.

## GNOMEExperience

The GNOME desktop (v2.26.3) greets you with GNOME Do right in the centre of the screen. Check it out; it's a very innovative application launcher. The top and bottom panels are somewhat customised—the workspace switcher is on the top right beside the clock, while detected mountable partitions are on the right side of the bottom panel. I certainly can't figure out the reasoning behind this sort of customisation.

The desktop theme is based on the greyish ClearlooksSL theme for controls, and the black MurrineCleanGlass window border theme, which gels well with the overall Sabayon look. Unlike KDE, desktop effects don't work out-of-the-box here. You'll need to activate the Compiz Fusion-based effects by double clicking the 'Compiz Fusion Icon' on your desktop. When activated, it triggers the Emerald Theme Manager to load up (accessible from the system tray), which gives you a handy selection of themes to choose from. On the down side, enabling Compiz gets rid of the Alt+F2 shortcut association to trigger the run dialogue on my system. A very displeasing bug!

There are two volume mixers on the top panel—one near the system tray, and the other, right next to GNOME menu. While the former doesn't work on my system, the latter does.

The default media player app is Totem for both videos and audio, and is capable of handling most media formats you throw at it. Rhythmbox is

missing, which I would have preferred for handling my audio files. The XMMS clone called Audacious2 is available to fill the gap, if we don't like Totem to handle audio. Besides these two apps, the 'Sound & Video' section has dvd::rip, Brasero Disc Burner, XBMC, and a bunch of Pulse Audio controls. Talking about PulseAudio, the controls don't work on my system—so I figure the integration is incomplete.


Unlike its KDE counterpart, the GNOME version comes with GIMP besides the F-Spot Photo Manager. However, by default, GIMP is associated as the viewer for images instead of F-Spot. We also have the full OpenOffice.org office suite and Evince to open PDFs.

As for Internet apps, we have the Deluge Bittorrent client, GNOME PPP, Firefox, Pidgin, a remote desktop client, XChat and Wicd (yet again, when we already have a working NetworkManager). Yes, there're a number of GNOME games available too—but that's all. So, if you want more apps, then install the distro and use Sulfur to install the apps you require.

## My experience

Overall, Sabayon is indeed a lovely distro. It looks great and is quite stable, yet it somehow gives the feeling that there's something missing, reminding me of the song, "All you need is love, love, love... Love is all you need." Or do I feel this way because I'm just too used to the mainstream Mandriva and the likes?

Whatever the reason, Sabayon does look pretty rough around the edges—a good example is the package manager, and the default selection of apps. So I figure it does need a lot of love if it wants to compete in the mainstream.

By the way, Sabayon comes preinstalled with a demo version of the *World of Goo*. It's very addictive; give it a try! 

By: Atanu Datta

He likes to head bang and play air guitar in his spare time. Oh, and he's also a part of the LFY Bureau.



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# Can the Minimalist Approach of

# CDlinux



## Win You Over?

In the world of minimalist GNU/Linux distributions, we introduce you to CDlinux, which originated in the People's Republic of China, in 1999. Four years later, in 2003, the first public release, version 0.4.2, came out. The latest version 0.9.4, which was released on September 3, 2009, is a mere 67MB.

CDlinux, or Compact Distro Linux, was primarily intended for systems administrators, as a system rescue tool. However, it can also be used as a bare minimum portable desktop OS and as a customisable OS base. The default desktop environment is Xfce (currently 4.6.1) with the Thunar file manager, thus ensuring that CDlinux cuts out the fat. The whole distro loads on the RAM, so the access is rapid. The official edition's RAM requirement is only 64 MB. CDlinux is capable of booting from CD/DVD and HDD. It also supports USB and IEEE1394 interfaces.

According to the head developer, Ben Zhao: "The original purpose of CDlinux was for it to be used as an emergency/rescue tool for systems administrators. But thanks

to the versatility of Linux, it can also be customised for other types of users. It was used in schools by the Yellow Sheep River project ([yellowsheepriver.com](http://yellowsheepriver.com)) several years ago, and now I am helping the Beijing International School ([biss.com.cn](http://biss.com.cn)) to set up a version for kids. I have also helped others set up CDlinux for applications like a firewall, NAS, etc."

Currently, there are two core developers of CDlinux, Ben Zhao and Penta Cai. I discovered CDlinux as an unmaintained and 'dead' distro in [linux.org](http://linux.org). But when I visited the official website, I came to know that though it was not very popular, it certainly wasn't 'dead' and is still being developed. After using the 0.6.2 version of CDlinux, which was about 57.2 MB in size, I was impressed. Far from being dead,

this distro was very up-to-date and under regular scheduled development. After getting in touch (through e-mail) with Ben Zhao, the targets and future plans of CDlinux became clear. After using CDlinux 0.6.2 for a brief period, I found that CDlinux lacked many graphical applications for everyday desktop use, though there was nothing that the command line couldn't handle.

When I asked Zhao about the missing applications, like word processors and image editors, he made it very clear what CDlinux was about and what its aims were:

"It's a pity that a word processing application is not included in the official release. But OpenOffice is too big. KOffice has too many dependencies, and the smaller ones are just not stable enough. Try to open a complex .doc, and you'll get a lot of crashes. And the i18n support is far from usable. AbiWord, Gnumeric, and the GIMP are already in the repository, along with many other applications like aMule, ClamAV (an anti-virus), Mplayer, Transmission, Wine, etc. We'll find a way to make them available with the next release. There are still some other packages with licensing problems, like Mplayer codecs (for various audio/video formats), libdvdcss (to play encrypted DVDs), Skype, Flash plugins, firmware for various hardware, and some 'Wined' Windows applications. Regarding those packages, I don't want to ship them with the official CDlinux, because we want CDlinux to be clean! Maybe in the future, we'll help to create a community release that contains these packages. Many GUI tools for CD/DVD burning, wireless networking, installation, saving settings, etc, are planned for the 0.7 release."

The focus of CDlinux is to be a good administrative tool, with only stable, necessary and free applications and excellent i18n support.

While the community edition was always on the radar, it finally got launched on October 20, 2008, featuring a lot of proprietary codecs, and a lot more applications. Today, CDlinux has three parallel editions:

**Mini:** Command line only, and uses Busybox with a lot of command line tools.

**Standard:** A superset of Mini, featuring Xfce, and a bare minimum set of applications. This only contains free software.

**Community:** Made from the standard edition by adding more graphical applications, this edition is more appropriate for the everyday home user. It also contains many non-free components.

I used CDlinux on an AMD Athlon64 X2 4400+ processor with a RS690G chipset, 2 GB RAM; the Intel Pentium D with ATI Radeon 200x integrated graphics and 512 MB RAM, and two more Intel systems (one Core and another Pentium MMX 200 MHz).

Let's briefly look at the various editions. We will be working with version 0.9.3. The latest 0.9.4 release is a bugfix maintenance edition and the site encourages users to update to it.

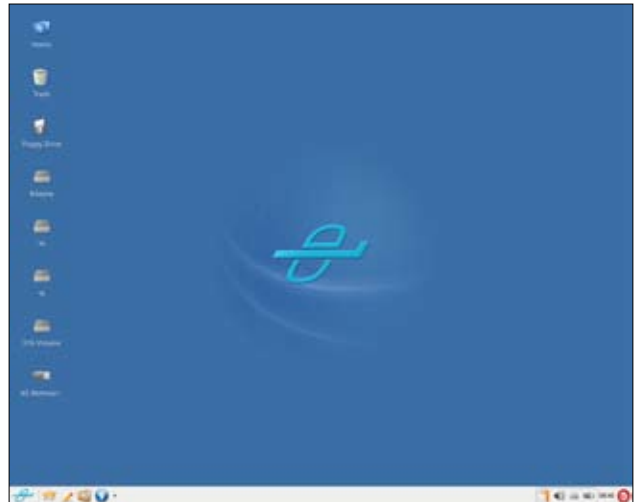


Figure 1: CDlinux desktop

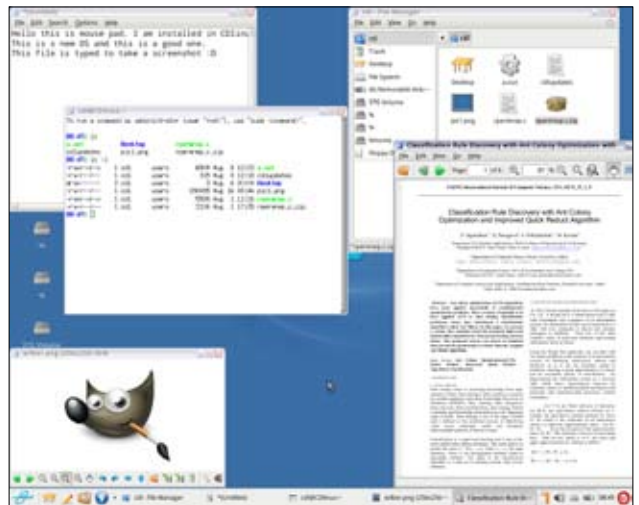


Figure 2: A snippet of available applications

## The standard edition

This edition is an official release of CDlinux and contains a patched version of the Xfce 4.6.1 desktop environment, a patched Linux-2.6.30.5, with Firefox 3.5.2, Pidgin 2.6.1, Slyphed (a mail client), ePdfViewer and GpicView (an image viewer). The older 0.6.2 release (standard) featured Xine with free codecs, which went missing from the 0.9.2 release. The 0.9.2 release contained TestDisk, which made it a better rescue tool and a new CDlinux HDD and USB installer.

To begin with, download the image of the latest CDlinux, burn it on a CD(RW) and get started. Enter the CD into the CD drive after you make sure that the system boots using the CD drive. Then select the language to boot CDlinux from the bootloader menu and press *Enter*. You will see the CDlinux logo in the boot splash screen for a few seconds. This was not present in the previous stable release (0.6.2), which used a text prompt. After this, the desktop loads smoothly. It auto-detected my default 1280 x 1024 desktop resolution

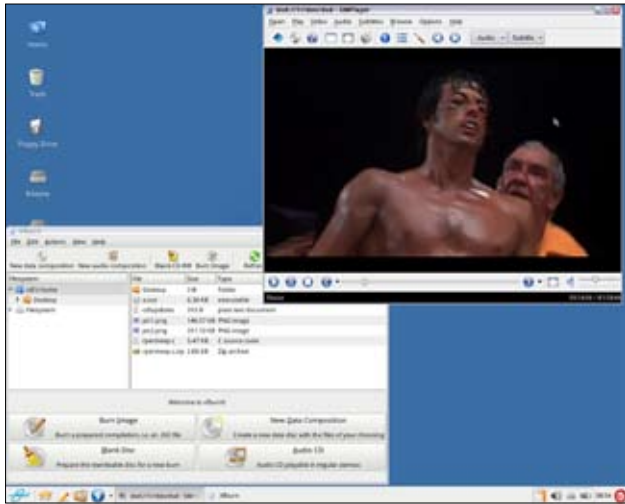


Figure 3: K3b and SMPlayer

and also presents a manual setting prompt.

The desktop shows the auto-mounted partitions. In my case, the distro successfully detected all the disks. The Xfce menu bar in the bottom contains the quick launch buttons, desktop buttons, the Xfce sound mixer, the time, the log off button and the Xfce menu button with the CDlinux logo. I can enter all the partitions and access the files. The 0.9.3 uses Xfce 4.6.1, which has a cooler look than the older one, with a new cursor and icon theme. The user drives of my Fedora partition were protected and could not be entered. Firefox 3.5.2 comes with the compact menu plug-in installed, which made the menus compactly fit into a button on the top left. It also had the 'Flash block' plug-in, even though the Standard edition didn't have Flash support. This plug-in is of immense use with the Community Edition (which has many non-free components). Since CDlinux loads on the RAM, the slow IDE HDD was not a factor any more. The experience was very smooth, without a single glitch or any slowdown. I have a habit of opening a lot of tabs by middle clicking on the links, and that slows down the system with my default Fedora 10 (KDE and Xfce). CDlinux allowed me to do this happily. Other than browsing, Pidgin was there to connect to chat accounts and to freenode. Mail client Slypheed was also present. The Internet experience with CDlinux was very good and I just didn't feel like logging into Fedora again. Xfburn was introduced in the standard edition 0.9.3.

In the *Systems* section, a new addition is the TestDisk data rescue and disk repair application. You can use this to recover deleted files, corrupt partition tables, manipulate the boot sector and a lot more. Other than Thunar, the default file manager of Xfce, CDlinux provides a patched and tuned version of Midnight Commander, which Zhao recommends. In the *Accessories* section, you can find a character map, the Calculator (a GTK2-based scientific calculator), and the Xfce's mousepad and Xarchiver. The 0.9.3 version

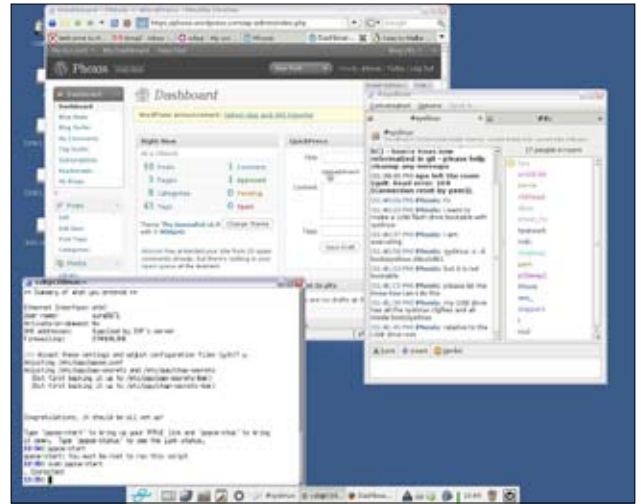


Figure 4: A few more apps

also introduces Clipman, the clipboard utility. Finally, we come to the rxvt terminal program to enter the command line. I tried enabling desktop effects from *Xfce control panel* -> *window manager tweaks* -> *compositing*. It worked fine without any visible performance degrade, except that when the transparency was enabled for moving windows, it went choppy. The CPU frequency scaling, a new update to this edition, adjusts the CPU clock for different loads. Change it as per your needs at *Settings* -> *CPU Powersaving Settings*.

The 0.6.2 CDlinux release contained no graphical HDD/USB installer, and it has to be installed manually by modifying an existing bootloader or installing one. In this version, I found a graphical installer that is still under development. The graphical installer is capable of installing CDlinux in a USB drive or in the Microsoft Windows C: partition. The installation of CDlinux is non-destructive and does not format or remove anything off the drive. It just copies the CDlinux files from the CD in the Windows partition and then installs the GRUB4DOS bootloader. Though this didn't work for me. If you know how to configure a bootloader, it can be easily installed manually.

The command line uses bash as shell, a patched Busybox for core utilities and lots of other programs, like fdisk, Parted, Syslinux, Grub, TestDisk, Midnight Commander, VI text editor, and wget. And oh! You can also find the 'chntpw' program with which you can reset Microsoft Windows account passwords and manipulate registry values. You need to 'sudo' to run a command as the root user, or run them in the super-user mode terminal.

## The community edition

The community edition of CDlinux has all the applications that we mentioned earlier and, in addition, a lot more extra packages like Wine (v1.0.1) (without OpenGL support), Java Runtime, SMPlayer, the Gimp, etc.

The booting time was a bit high for this edition. This might be because it copies the packages onto the RAM,



but you can ask the OS not to load the modules onto the RAM, and mount them in loop mode, instead, with the CDL\_LOOP kernel parameter. After it boots in, you will get the same smooth performance as the standard edition, once you reach the desktop.

I started with the multimedia section, which is the deciding factor for me in selecting an OS for general desktop use. I found Livestation 2.7.0 for livetv and radio broadcasts, which replaced Gmlive from v0.9.3, two front ends of Mplayer, the Mplayer GUI and SMPlayer, and a burner called Xfburn. The audio and video experience was pretty good as the support of non-free codecs was out-of-the-box. The Internet menu revealed a lot of applications including Firefox 3.5.1, Pidgin and Slypheed – other additions are Skype2.0, Filezilla, aMule, etc. The redundant Opera in v0.9.2 was removed in 0.9.3. Zoho is used as the office suite, but GNumeric, a spreadsheet application is also included. The 0.9.3 version has a new addition — KchmViewer, a compiled HTML viewer. Printer support was lacking in the standard edition. The community edition comes with CUPS and printers can now be configured. You can also configure a wireless network with the help of wicd (not in the standard edition).

The strange part is that this edition comes with the Avast anti-virus, home edition, though you need to register with avast.com and get a free personal-use serial number to activate it. With TestDisk from the standard edition, the community edition also comes with the popular Partimage and Gparted partition managers, making partitioning easy.

And of course, it has a *Games* section containing Minesweeper, card games, and DOSBox. DOSBox is not a game but a DOS emulator. It often comes into the 'games' category because of its usefulness in running classic games like Alladin, Prince of Persia, Invaders, Wolfenstein, etc.

We now have GCC (v3.4.6), as it now (v0.9.3) supports compiling the official Linux kernel and also additional modules and drivers.

Check out the full list of applications of the CDlinux Community Edition at [CDlinux.info/wiki/doku.php/releases/0.9.2/packages](http://CDlinux.info/wiki/doku.php/releases/0.9.2/packages)

## Customisation

The main attraction of CDlinux is that it provides an operating system with the latest Linux kernel, drivers and a bare-minimum set of applications that are updated and stable. CDlinux provides the base of the operating system on which you can add building blocks to make a complete OS that exactly matches your needs. This is unlike others like Puppy Linux and Slitaz CDlinux that currently do not have any 'remaster' tools. To add customised packages to CDlinux, it needs to make/download the squashfs md images of the applications and place them in the 'local' directory of the CDlinux

directory hierarchy to be auto-detected by CDlinux. This is just like the puppy .sfs squashfs packages. Even desktop environments other than Xfce can be used on top of the Mini edition. Because CDlinux doesn't have any repository as of now, .md packages are not available easily and one has to make or hack them from the community edition. Though this might not be very customisable for general users, it definitely is very interesting for geeks. As CDlinux approaches the 1.0 release, we can expect CDlinux repositories to become available with .md packages.


CDlinux provides some boot parameters that are very easy and extremely useful. Check out *CDlinux.info/wiki/doku.php/doc/faq/cdl\_options* for details on boot parameters.

## Support

This is where CDlinux lets you down. According to Zhao, there is documentation and support for CDlinux, but mostly in Chinese, so it is of no use if it is not translated for non-Chinese users. You will get very little documentation for CDlinux customisation. Older documentation relevant to the 0.4 release of CDlinux can be found in [CDlinux.info/archive/0.4/howto.html](http://CDlinux.info/archive/0.4/howto.html). There is no dedicated forum or an IRC channel. According to Zhao, new documentation is being written.

## Gazing into the crystal ball

When I asked Zao what his favourite feature of CDlinux was, this was what he said:

"Yes, CDlinux is stable and up to date, and it is compact. The features and libs/apps of CDlinux are carefully selected. We only ship stable and usable applications — no flashy ones. CDlinux is clean. In fact, we are very proud of CDlinux — there is too much to talk about, like it can be run in memory, which has been a feature of CDlinux since its birth. I think the best feature of CDlinux is its i18n support. CDlinux supports i18n for all major languages/locales (over 100). Although for size considerations, l10n support is limited, users can easily extend CDlinux to support l10n for their own language/locale. Many applications are fine tuned/patched, e.g., if you use Midnight Commander (my favourite file manager), you'll find that the version in CDlinux is the best. Cheers!" 

### Links:

- Official website: [CDlinux.info](http://CDlinux.info)
- FAQs: [CDlinux.info/wiki/doku.php/doc/faq/index](http://CDlinux.info/wiki/doku.php/doc/faq/index)

### By: Arjun Pakrashi

The author is currently pursuing a B.Sc in computer science from Asutosh College in Kolkata. His main areas of interest are open source software, Linux programming and data structures. He plans to do research-based work, and become an OSS contributor.

# A Liberating Learning Infrastructure

Last month we looked at FOSS applications for beginners and students. In this article, we will look at FOSS-in-the-large as applied to a learning environment.

*T*his article is a broad overview of the technology solutions available for learning and does not prejudge any solution as automatically fitting a particular requirement. The data gathering and decision making is left entirely to the reader. If this and the previous article can spur you to explore that part of the FOSS ecosystem that caters to education, they would have served their purpose.

## School infrastructure

A common or default approach for a school

computer lab is a network of PCs exclusively running a proprietary OS with some shared directories that host the learning resources. Each student gets a full-fledged PC as a workstation. What could be easier? There is always an obliging hardware vendor around the corner and those helpful education 'discounts' on proprietary software are so tempting.

This approach is wasteful, both in terms of money and energy (aren't we teaching children about carbon footprints in our environmental education classes?). The software is probably hosted individually on each machine and maintaining it is a chore, not to speak of the recurring licence and upgrade costs.

Contrast this with a FOSS approach, which has a high capacity server for multiple student



terminals. These could be low-end machines running Atom-like processors or even old PCs that were heading for the scrap heap because they could not run some bloated proprietary OS. All that these terminals (now functioning as thin clients) need is the capability to boot from a network. What's more: such a set-up also allows you to interface Wintel machines from that part of your set-up that needs a proprietary computing environment.

The advantages of this computing architecture include: easy software updates (you only require to update the server/s), potentially lower power requirements, and enhanced security. All this thanks to the Linux Terminal Server Project (LTSP).

Check out the success stories at [ltsp.org](http://ltsp.org) for what real people are doing with such set-ups. Also, try *K12LTSP.org* for a Linux distribution that bundles LTSP with CentOS, and *K12Linux.org* for a Fedora distribution that bundles LTSP with it.

A software application called iTALC enables you to control all terminals from a central master workstation in the case of a large deployment of terminals. It allows, for instance, a teacher to give a demo from her terminal and make it appear on all student terminals.

The FOSS world around Linux also offers other technologies to facilitate virtualisation, enhanced security, spam protection, desktop publishing, and a host of other business functions, all in a virus-free environment with a range of very functional and attractive graphical desktops. This by itself would make FOSS a strong contender to run a school's entire IT infrastructure rather than just the computer lab. But wait till you learn about what else FOSS has to offer for a learning environment.

## Information management

Even small- to medium-sized schools can reap the benefits of information management. FOSS offers some sensible options here too. The list is not complete, and I might have missed your favourite application.

SchoolTool ([schooltool.org](http://schooltool.org)) calls itself a student information system. It can be



Figure 1: Koha catalogue at DPL

deployed at the school level to track attendance, grades, demographics, timetables, and calendars. It does not cover accounting. It can also be used by individual teachers on their laptops to track the classes they are teaching, for instance. SchoolTool is backed by the Shuttleworth Foundation ([shuttleworthfoundation.org](http://shuttleworthfoundation.org)), which works closely with the South African school system to promote FOSS.

OpenSIS ([opensis.com](http://opensis.com)) is a comprehensive SIS that could easily rival commercial offerings. The base system comes free. Additional modules and support can be purchased. There is a hosted service too, in case schools do not want to host their own system. However, the basic system appears quite adequate to give a clear productivity boost to a school's processes.

OnlineGrades ([onlinegrades.org](http://onlinegrades.org)) is not really an online grade-book, but helps host information on grades in a secure manner for controlled access by students and teachers.

Openadmin for Schools is another SIS for schools





that has a gamut of features. It has a well-maintained site and a very active development and release schedule. It has a surprisingly large number of downloads from India. There is another SIS that goes by the unpretentious name of Centre (*miller-group.net*). But do try out its demo site because the software functionality and customer support seems anything but unpretentious.

The Kuali Foundation (*kuali.org*) has the Kuali Financial System (KFS), an open source financial package for institutions of higher learning. They are also working on a student system. KFS has commercial support available from established names.

Koha is a popular Integrated Library System (ILS) that is being used by many libraries in the world including the Delhi Public Library. It is immensely scalable, making it amenable for use even by smaller school libraries.

## Learning management

The primary purpose of a school is to promote and facilitate learning. The world of FOSS offers quite a few applications that help host learning material, making it accessible to the students in a controlled environment, and then facilitating the evaluation of students on what they have learned.

Moodle is a celebrated course management system (CMS), or learning management system (LMS), with a large community and almost a fan following. It is feature rich, allowing you to host your own lesson material and evaluation tests organised by virtual classrooms.



Figure 2: Moodle courses



Figure 3: Claroline demo

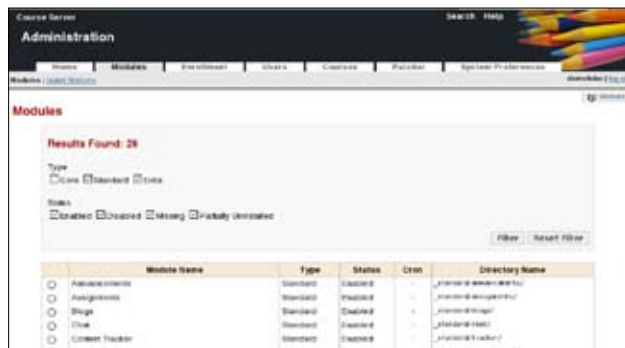


Figure 4: ATutor demo page

Claroline (*claroline.net*) is a compact course management system with some basic exercise types available for students. It is well suited for light duty applications such as online orientation for new employees.

Sakai (*sakaiproject.org/portal*) is a collaboration and courseware management platform. It is enterprise class with support for up to 200,000 users. It is claimed to be written by educators for educators. Check out the *References* section to learn how Stanford University is using Sakai.

ATutor can be counted with the best amongst the learning management systems, built with accessibility and adaptability in mind. With a rich feature list that takes some time to absorb and a list of useful modules for expandability, ATutor is a must-have on your evaluation short list.

LRN (*dotlrn.org*) is an enterprise class software solution to support e-learning and to build digital communities. Most FOSS enterprise class solutions come with a committed and active community of stakeholders whom you can interact with for help, feedback, or plain *gyan*. LRN, too, is backed by a community of stakeholders.

ILIAS (*ilias.de*) is an LMS with German origins and has a very distinguished cooperation network or advisory board. Spend some time on the website and you'll immediately realise how complete and well documented it is, besides marvelling at the lengths the developers have gone to make it accessible and usable. There is a detailed client list, including some case studies. The latest stable release is barely a couple of months old. Is it a candidate for your evaluation short list? You bet.

As an aside, you may not appreciate the value of a community until you realise that most closed-source commercial/proprietary products are completely managed by product management teams of a finite size. These teams may not necessarily have the user community as their primary driver due to corporate compulsions. (We have heard that before, haven't we?). In contrast, community-driven products, with the greater wisdom that goes into them, evolve more solidly, and not necessarily any slower. The evolution of GNU/Linux

itself is a good example with a bleeding edge Fedora release every six months.

A company might withdraw support for a product or coerce you to upgrade a product that you have invested in, heavily, and are perfectly happy with in its current version. You will find no such compulsions with community-driven FOSS software. Communities do not vanish overnight—unlike software companies that sometimes do. And even if a community did vanish, in a worst-case scenario, with the source code available (remember, this is not closed source) you have your insurance papers right in the top drawer.

Hosting your own LMS is all very well. You also need to keep it current and supplied with content. This means you need to equip qualified lesson authors on your staff with the right tools. Most LMS have integrated authoring facilities. However, offline authoring and publishing has its attractions. It allows people to work in seclusion and then sync up with the LMS. A tool that enables offline authoring and publishing is eXe. It allows teachers and academics to focus on their content rather than the intricacies of HTML.

Most FOSS LMS have no-obligation demo sites. You can try these demos as often as you want and show them to the decision makers in your institution. Contrast this with the time-bound evaluation versions for proprietary software that give you the feeling that you are being done a favour.

I am sure you took your school timetable for granted. Either you remembered it all, at least the days you had two back-to-back history periods, or just didn't care and carried all the books you could. I bet you never realised then that timetabling is a constrained scheduling problem. Throw in a few thousand students, perhaps a hundred or more teachers with the usual set of courses, and timetabling becomes a really complicated business. Fortunately, there is FET ([www.lalescu.ro/liviu/fet](http://www.lalescu.ro/liviu/fet)). It is a fairly capable tool with a certain learning curve and can scale very well from small schools to departments to large institutions. You can scan the fine-grain, enumerated feature list to check if it meets your requirements.

Learning by itself would be only half the fun were it not for the tests. Jokes apart, learning would not be complete without a reasonable and objective assessment. TCExam ([tcexam.com](http://tcexam.com)) is a CBA/CBT (computer-based assessment/testing) system. It allows you to build a simple testing strategy. Built on the robust and familiar LAMP (Linux, Apache, MySQL, PHP/Python/Perl) stack, it supports rich content in the form of pretty-printed questions, formulae, and video/audio content. There are i18n (internationalisation) and accessibility features available for students with special needs, too. The application supports question banks so that each candidate gets her own unique test with a mix of questions. Such a feature is well suited for administering those on-demand tests that are very much in the news these days. The strong security and authentication features allow it to be used on the extranet as well.


## Is it worth a try?

Unless you are already very happy with the information/learning management systems used in your school, the answer would be an emphatic, 'Yes'. That FOSS is a new technology and learning paradigm that should be taught to all students is an equally strong reason, in my opinion. Even if you do not want to jump on to the FOSS bandwagon with all your baggage, you can evaluate specific FOSS applications in isolation.

You could sandbox a portion of your computer lab network and run a small pilot with the active participation of teachers and students. There is nothing to lose; there are no evaluation licences or nagging salesmen spewing words like 'layered' and 'unbundled'. On the other hand, you might be amazed by how these solutions—individually or collaboratively—extend the reach of your teaching function and take the deployment of your learning course to the next level.

Not to make too fine a point of it, all FOSS applications have their source code available. This, along with the four freedoms of FOSS, allows you to customise and localise the software to your requirements and also contribute back to the community. Both of which, the eager, tech-savvy students of today would love doing. However, most, if not all the applications we have discussed so far seem to be usable out-of-the-box.

Do make sure, however, that you engage good technical help for the required handholding. And do not forget to familiarise yourself with the vocabulary used in the LMS domain. Is there a role for a 'Chief Education Officer' in institutions? Continuing education is the shape of things to come; perhaps it is not just coincidence that this role abbreviates to CEO! Fortunately, this role already exists in some organisations as Chief Learning Officer; so the real CEOs can breathe easy.

Once you start your journey, you might realise that it is not so much about technologies or paradigms as much as it is about prejudice, nay-sayers, entrenched mindsets, and commercial vested interests. Learning is all about discovery and breaking new ground. When are you starting on your voyage of discovery on what FOSS has to offer the world of education? 

### References

- <http://www.rsmart.com/case/stanford-university-sakai-provides-significant-potential-and-opportunity>
- Screenshots are taken from [demolabo.com](http://demolabo.com), which runs demos of many packages and offers content under the cc-by-sa licence

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# Turbo Boost *your PC*

**Benchmarking and  
Overclocking in Linux**



Are you ready to raise the bar? Ready to witness a performance from your PC that you'd not seen in years? Then tighten your seat belt, grab a chilled drink and get ready to exhaust the tower with the monstrous benchmarks!



**M**ost PCs today—i.e., if you own a processor like the AMD Athlon (90/65nm) or Core 2 Duo and above—come with decent headroom to increase performance. The question is: have you ever considered pushing the limits?

If so, tighten your seat belt, because in this article we will not only learn about torturing the hardware, but also unravel the facts about overclocking your hardware and the status of benchmarking in Linux.



**Note:** Overclocking is raising the clock speed of the processor from the factory settings. Benchmarking, on the other hand, is an assessment test to measure the capacity of the hardware at your disposal.

Some of you must be mulling over what Linux has to do with overclocking? Well, yes, the operating system has very little to do with overclocking. But when you pump up the speed of your system, then various things need to be considered. The operating system chips in by offering various monitoring tools and other requisites.

Note that this tutorial will only guide you with the basics of overclocking. Since it's a very vast topic, and the overclocking options vary from motherboard to motherboard and the BIOSs they come with, more details are out of scope of this article.



**Statutory warning:** Overclocking is fun to begin with, but reckless decisions can bring your whole system down. The author and the publisher will not be responsible for any damage caused, and what's worse is that afterwards, you will not be covered by the product warranty either. So, you'll need to remember one thing—slow and steady wins the race.

The only precautionary measure is not to take hasty decisions—stay calm, and nothing will go wrong. The fact is, overclocking is highly addictive, so beware and don't let your excitement overtake you. Because once you get overexcited, you will surely end up doing something wrong.

Now that we're done with the warnings and introductory notes, let's move on. Overclocking requires a few tools and utilities as well. But for what, you may ask? As I mentioned earlier, overclocking needs to be done through the BIOS. Yes, the best and rudimentary way to overclock is from BIOS. However, once you have overclocked the system, there are several factors that need to be dealt with.

The most important is the temperature. Temperature plays a vital role in the life of silicon. All the diodes/chips/processors are made using silicon, so the temperature must be kept under control. We will get to know more about it later. But before that we need some software to monitor certain things for us.

Unfortunately, the software potpourri isn't as diverse as that of Windows, but still, there is a decent amount of benchmarking and monitoring software available for Linux. In this article we will take a look at the following:

1. **Hardinfo:** A one-stop shop for all the monitoring utilities in Linux
2. **Phoronix Text Suite:** Undoubtedly, a vast and the most popular benchmarking suite for Linux
3. **Geekbench:** Another cross-platform benching program
4. **Prime95B:** A CPU stress-testing program

The test set-up used for overclocking and benchmarking is described below:

- AMD Phenom II Dual Core X2 550 Black Edition processor (unlocked to Phenom II Quad Core X4 B50), with 45nm fabrication and socket AM3
- Jetway Ha07 790GX AM2+ motherboard
- Transcend DDR2 800 MHz 4GB kit @ 5-5-5-15/dual channel
- Western Digital 640AAKS Blue Edition hard disk drive
- Prolimatech Megahalems + Scythe Sflex 120mm 75cfm fan (CPU heat sink and fan)
- Corsair VX450 SMPS | open air system
- Operating systems: Ubuntu 9.04 64-bit and Mandriva 2009.1 32-bit

## Benchmarking your PC

Before we get started, we should know about the types of benchmarking. There are many benchmarking applications and methods to test the system. These are generally segregated into the following two categories:

1. **Real-world benchmarking:** All benchmarking of real tests such as FPS (frames per second) in games, the time to compile software/the kernel, the encoding/decoding time of media files, etc, fall under this category. This is perhaps a more practical way to judge a PC's calibre. Most benchmarking software don't cater to real-world benchmarking; thus, these tests are done by using the computer on a daily basis.
2. **Synthetic benchmarking:** All software and tests designed to appraise the system potential are termed as synthetic benchmarking software. These are good to obtain quick results, and one doesn't need to waste much time running tests, one by one. However, some of the software tends to favour certain brands and products. For example, the Super PI test favours Intel processors while the AES benchmarking favours AMD processors. Thus, these are not always the premier solution to judge a PC's potential.

## Hardinfo

Sleuth tools let you obtain crucial information about your hardware. These tools not only provide valuable information but also prove to be viable alternatives to digital multimeters and power calculators. Unfortunately, there aren't many alternatives available on the Linux platform, and this is where Hardinfo chips in to provide the perfect

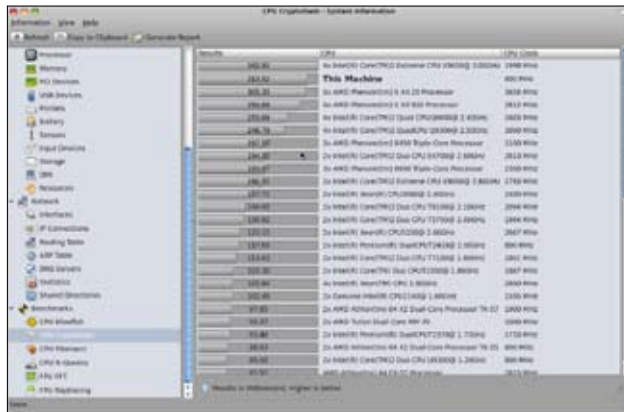


Figure 1: Hardinfo Benchmark

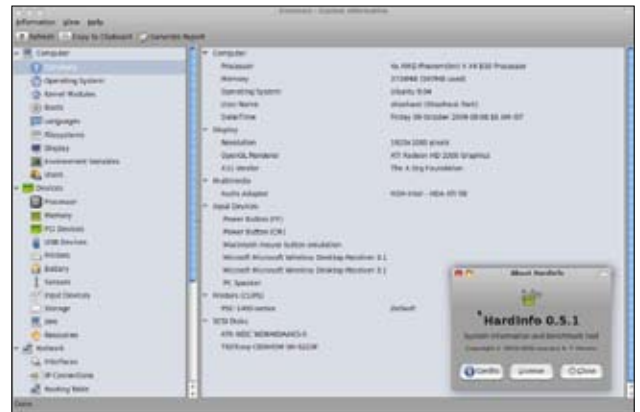


Figure 2: Hardinfo Default Looks

blend between a hardware listing and a decent benchmarking tool.

Hardinfo [<http://hardinfo.berlios.de/HomePage>] delivers precise details about the hardware installed and the connected devices atop an easy-to-use GUI. The website claims that the tool "...can gather information about your system's hardware and operating system, perform benchmarks, and generate printable reports either in HTML or in plain text formats."

The app's interface is segregated into two columns. The left column serves as the navigation bar that consists of a plethora of hardware categories, which are further divided into relevant entries. The section on the right side is the overview panel that displays some information about the entries you select from the navigation panel. When you select an entry, a new panel is created to show detailed information about the selected item.

Apart from its hardware listing capabilities, Hardinfo provides a handful of benchmarking tests to put your system through rigorous exercises. The default installation doesn't come with much data on the benchmarking front to compare your system with other hardware. However, you can easily sync with the online database (click *Information*→*Network Updater*). Updating the database adds the data of the computers that have been tested.

Sharing data online and then syncing the software is really a great idea and lets you easily compare

your system's potential with others. I advise you to sync the system with the online service, once. This not only increases the size of the hardware database, but is beneficial for others as well. Hardinfo also provides a Report Generator. This handy plug-in allows you to generate system information along with benchmarking results, either in HTML or plain test format.

This information about the system will provide a verbose report covering the X server, the Linux distribution, hot-swappable devices, network information and lots more. It even displays the temperature using the system diode; however, I found that to be faulty—my motherboard LED indicator displayed a significantly lower temperature than that of Hardinfo.

Nevertheless, there are still many things missing from the elusive Hardinfo. Shortcomings include the missing voltage meter, dynamic speed reader, and many more. A dearth of these components is surely a big setback for any hardware listing tool,

and without these tools one cannot make proper judgements while overclocking.

## The Phoronix Test Suite

Phoronix Media, one of the most popular and reliable sources for Linux news and reviews, presented the first benchmarking test suite—the Phoronix Test Suite (PTS). Phoronix regularly publishes hardware/Linux benchmarking reviews using PTS, which throw some light on what PTS is capable of doing. Initially restricted to the CLI, PTS goes through massive transitions from release to release. It has now jumped onto the GUI bandwagon, loaded with an easy-to-use GUI. It comes with support for almost all distributions and is available in the repositories of many distributions.

I'd say Phoronix takes benchmarking to a whole new level, being the only one of its kind that provides users the option of 'live benchmarking' (thanks to the availability of an Ubuntu-based live

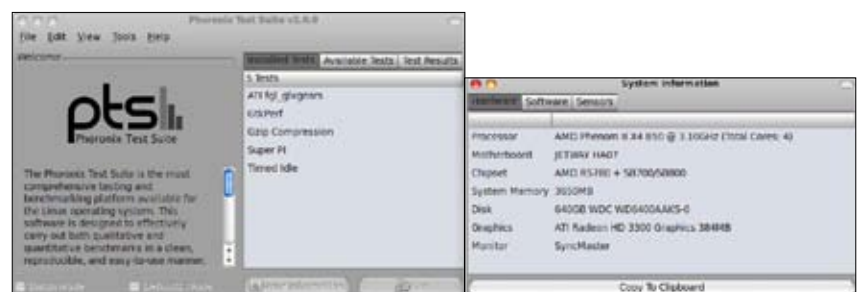


Figure 3: PTS System Overview

DVD). So all you need is a system with a DVD drive to enjoy the test suite.

Installing it is very easy and you can do so by using your system repositories or the executables provided at the project website. PTS actually acts as a wrapper for many open source/proprietary software that are available off-the-shelf.

By default, PTS doesn't come with a single benchmarking utility installed; rather, it provides an option to install them the way you want. In order to get the most out of PTS, you have to install the tests, one by one. Some tests are as huge as 700 MB, and thus installation can be a bother. It would be much better if Phoronix additionally allowed users to install multiple tests in a single click, with options like 'Tests for Processors', 'Tests for the GPU', and so on. The pack must consist of a handful of relevant tests that fall under the particular category the user is interested in.

Phoronix allows users to easily upload their results to Phoronix Global. This is a portal where you can view your results (the same way you view them offline), and from where you can make comparisons with others. In fact, the application itself prompts you to compare the result with the tests that Phoronix developers have uploaded. A very nice approach that does away with the hassle of searching for the test results to compare with your outcome.

Phoronix also provides a small system 'overviewer' that keeps you informed about hardware, software and sensors. Things are very neatly arranged in their proper categories. It even allows you to copy all the data to clipboards and then share them easily. However, in my case, it failed to detect the IGP (on-board graphics) speed. The system memory usage data was displayed incorrectly as well.

The downside of PTS is that there is no notification whatsoever while installing and running tests. Once you initiate the process, the PTS window will vanish and the user has no idea of what's happening in the background. Even though it was mentioned that support with Ubuntu notification has been added, it didn't work in Ubuntu 9.04 64-bit. Instead, a simple status message on the PTS window should have sufficed.

## Geekbench

Geekbench is another efficient benchmarking software for Linux. Despite claiming to be cross-platform software, it only provides a GUI for Windows and Mac, leaving Linux

with a CLI offering. Nonetheless, the application offers a complete benchmarking solution capable of wrenching the most out of your CPU and memory.

The Linux version is an easy to execute binary file that runs from the terminal. After executing it, the benchmarking will commence and automatically complete all the tests. In the end, it will ask you to submit the data, online. If you have a working Internet connection, you can easily submit the data and add it to your profile (if you have an account). Pretty nifty indeed!

The online score browser displays scores in coloured charts—this is where you can compare your scores as well. Unlike other benchmarking software, this one gives an overall score to the system providing a rough idea of what the system is capable of.

Compared to the other two benchmarking utilities mentioned, Geekbench is not an open source application, although the developers have open sourced the detection engine (geekinfo) under the MIT licence. The detection engine seems to be flaky—it fails to detect my motherboard manufacturer and model. Apart from that, it failed to even detect the operating system used. It only showed the kernel under use instead of the distro. Since Geekbench developers want you to buy the software, they have restricted the availability of the 64-bit executable.

One of the biggest drawbacks was the overall inconsistency in scores. I tested Geekbench in all the supported OSs, namely OSX, Windows and several distributions, keeping the hardware intact across every OS. Initially developed for Mac OS, Geekbench still favours that OS by delivering the highest scores on it. The claims of providing an OS-neutral benchmarking engine seem hollow, and the statements are contradictory to the scores.

## Benefits of benchmarking

Many of you must be muttering about all this information on benchmarking. Why waste resources? Why go through such trouble and waste time just for a few numbers? Well, because benchmarking is the easiest way to gauge your system. Today, all system components—be it the CPU, memory, hard drive, graphics adapters, power supply, etc—are thoroughly benchmarked and tested, and then, accordingly, manufacturers rank them by price and performance.

Benchmarking creates a sense of judgement among users. It keeps you updated about the potential of

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## Jargon Buster

- **Clock speed:** This is the speed at which your processor runs under factory settings, and is calculated in Gigahertz (GHz) or Megahertz (MHz). The clock speed is generally obtained from the product of FSB/HTT/BCLK and CPU multiplier. Note that whether it's FSB, HTT or BCLK depends on the type of processor you own.
- **FSB (Front Side Bus):** This acts as a main bus speed for the processor, RAM, northbridge and southbridge. The FSB lies in the motherboard and has a memory controller alongside it.
- **HTT (Hyper Transport Technology):** This is the new generation of FSBs that are used by AMD processors. HTT is nothing but the FSB, excluding a memory controller. In AMD processors, the memory controller lies inside the processor, and that provides more flexibility throughout; as a result, AMD processors support multiple memory types. For example, Phenom II, Athlon II and Sempron 140 (i.e., the 45nm series of AMD processors) have multiple memory controllers within, allowing them to use either DDR2 or DDR3 at a time.
- **BCLK (Base Clock):** This is a refined FSB that has been developed for Intel processors and debuted with the Core i7 series of processors. The BCLK is nothing but AMD's HTT. The processor comes with the memory controller. Previously, all Intel processors—Pentium, Core2Duo, or Core2Quad—had the FSB, which limited their memory handling capabilities. With Core i7, Intel has now a memory controller merged within the CPU itself and with triple channel support providing humongous bandwidth.
- **CPU multiplier:** As mentioned earlier, this value when multiplied with the FSB/HTT/BCLK, gives the processor's clock speed. And since the Special Edition processors have the multiplier unlocked, they allow processor overclocking. Thus, you don't have to tinker with the FSB/HTT/BCLK if you have a Special Edition processor. However, you are even free to take the FSB/HTT/BCLK route if you want.
- **Integrated memory controller:** This determines the speed, type, channel and the amount of memory that can be installed in the system. With new processors, the memory controller is now merged into the processor. As a result, you don't have to change the processor in order to utilise newer and faster memory, if supported. For example, the new 45nm Phenom II from AMD comes with a dual memory controller allowing you to use either DDR2 or DDR3. So you can put the processor in an AM2+ board and use DDR2, or in an AM3 board to use DDR3. This gives a wide spectrum of options to users either to opt for the high-performance DDR3 or the value for money DDR2. As a result of multi-channel memory, motherboard manufacturers release hybrid boards with both DDR2 and DDR3 slots. So all you need to do is buy one board and RAM of your choice. If, in future, you want to make the transition from DDR2 to DDR3, then you don't have to buy a new motherboard. This contrasts with processors like Intel Core2Duo or the Pentium series, which had the memory controller on board. Thus, in order to get a higher performance RAM, you need to change the motherboard, which adds to costs.
- **CPU core voltage (VCORE):** In order to gain a stable clock speed (which works 24x7 under a full load, without any problem) we need to increase the voltage applied to the processor. By applying more voltage, we give more power to operate. More power generates more heat, and thus we must opt for a good after-market CPU cooler if you are aiming for higher clocks.
- **Memory speed:** Once you overclock your system by tinkering with the FSB, HTT, or BCLK, you substantially overclock other components as well. All the other components like memory, northbridge and southbridge, thrive on FSB, HTT or BCLK for their own clock speeds. So once you change the relevant BUS, you overclock the whole system. Memory is affected as well. Memory speed is determined by the product of FSB/HTT/BCLK and the memory multiplier. Note that just like the CPU multiplier, memory too has its own multiplier.

your hardware. You can check benchmarking journals to keep yourself updated with all the reviews of the new hardware flowing into the market. Whatever said and done, it is a perfect option to test your hardware.

## Amplify speed by overclocking hardware

Overclocking is like losing weight—the initial results come very fast, but the last pounds (read MHz) take some real effort.

Almost all the hardware components can be overclocked. This is due to the fact that most of the components are interlinked and work in synchronisation. Since this requires tweaking the system above the factory settings, it means increasing the power consumption, heat dissipation and many other factors. So before we get started, here are the mandatory things that need to be dealt with:

### 1. Exterminating dust:

Accumulation of dust decreases

a component's life span and performance, while decreasing the heat dissipation. Dust traps the heat and does not allow it to dissipate properly. It is very important to keep the dust away. So, open the cabinet and clean all components. Cleaning reduces noise, components run cool and hence their performance increases, significantly increasing headroom for overclocking. Make sure you are properly grounded, else the static

electricity from your body can damage the hardware components.

2. **Airflow:** Airflow plays a vital part in overclocking. A good airflow can decrease temperature drastically while bad/misaligned airflow can be fatal. Cabinets now come with at least two fans—one intake (front) and one exhaust (back). Usually, 120mm fans are preferred. Airflow is generally measured in CFM (cubic feet/metre). The more the CFM, the better the fan and its airflow. Few of the good brands are Scythe, Silverstone, Xigmatek, Antec, etc.
3. **Thermal compounds:** Also known as thermal pastes, thermal compounds are an important factor in cooling CPUs and GPUs. They transfer heat to the heat sink. A good thermal compound can reduce temperatures by 2-5 degrees Celsius. Some of the known brands are Arctic Cooling, Tuniq, etc.
4. **Cable management:** Messy cables inside the PC can hinder airflow, thus increasing the temperature. Cables hovering over the components can suffocate them resulting in their failure. So it's better to tie them, keeping them aside and away from the components' blowing/intake vents. You can use cheap cable ties to get the best results. If you want a permanent solution, cable covers and management kits are available off-the-shelf.



**Warning:** Although this guide encourages you to experiment with overclocking, I highly condemn the practice with laptops and desktops loaded with Pentium 4 (any generation) or Pentium D. These components usually run very hot and overclocking can result in system fiasco.

As I've mentioned earlier, overclocking is a vast topic, but in this article, we will only focus on CPU overclocking and not consider GPUs due to the dearth of mature

## After-market heat sinks

Most hardware components suffer from the repercussions of overheating and other thermal catastrophes because of heat generation. Therefore we use heat sinks which helps in absorbing heat and keep the temperature from rising above safe levels.

To attain a higher CPU clock speed with well-controlled temperature, many companies offer after-market coolers. Most of the manufacturers allow high scalability by providing compatibility across all sockets of AMD and Intel. Therefore, even if you change the platform in future, you can continue to use the cooler, if compatible, or can increase the compatibility by spending on the mounting kit, if provided. Some of the top brands in the market are Thermalright, Prolimatech, Scythe, Arctic Cooler, Coolermaster, etc.

If you intend to buy a cooler, then here is the list of some coolers that you can get for varying budgets:

- **Rs 1000-1,400:** OCZ Vanquishes 120mm (comes with fan installed)
- **Rs 1,500-2,000:** Thermalright Ultima 90 (doesn't include a fan) | Coolermax Hyper TX2 Super (comes with fan)
- **Rs 2,000-2,500:** Sunbeam Core Contact Freezer 120mm | OCZ Vendatta 2 (both include a fan)
- **Rs 3,000 and above:** Thermalright Ultra Extreme 120mm | Prolimatech Megahalems (both don't come with a fan)

overclocking software for them.

CPU overclocking varies from processor to processor. Intel and AMD follow different approaches towards overclocking. To make things a little more complicated, CPU manufacturers opt for new terminology, which is often nothing more than a gimmick. Things are not as different as they seem.

There are generally multiple ways to overclock—manufacturers provide many options to boost speed. Generally, there are two types of processors available in the market: one with the locked multiplier (refer to the sidebox titled "Jargon buster") and the other is with an unlocked multiplier. Processors with unlocked multipliers fall into a special category and are often termed as 'Special Editions'. Intel uses the term Extreme Edition and AMD's offerings are known as Black Editions.

Both these special edition processors are cherry-picked, and have the best die and unlocked multipliers in them. As usual, they come with a premium in price. Thankfully, AMD's Black Edition won't burn a hole in your

pocket and a dual core is available for under Rs 6000. On the other hand, you will have to spend around Rs 50,000 for Intel's Extreme Editions. Yes, that's half a lakh for only a processor.

Take a look at the box to become familiar with some of the jargon used in relation to CPUs.

So once you have gained some knowledge about the basic terminology used while overclocking, it's time to overclock the system.

Generally, the preferred way to overclock the system is by tweaking the BIOS settings. Refer to your motherboard manual for precise information—different motherboard manufacturers have different BIOS menu structures.

We will start by disabling some energy efficient technologies that chip giants have actuated in the chips themselves. Here is the list of options that need to be disabled:

- **AMD Cool n' Quiet:** This is a power-saving technology that lowers the CPU clock speed and voltage when the processor is idle. This keeps the CPU from

## System buying guide

Here is a list of systems with fairly decent overclocking headroom:

## Budget System, around Rs 15,000

▪ AMD Athlon II X2 250 .....	Rs 4,000
▪ Biostar A785GW – (ATI HD4200 Integrated Graphics).....	Rs 3,200
▪ Transcend 2GB DDR2 800 MHz RAM .....	Rs 1,200
▪ Western Digital 320 GB SATA2 Hard Disk .....	Rs 2,200
▪ Samsung/LG DVD Writer.....	Rs 1,200
▪ Gigabyte Superb 460W SMPS.....	Rs 2,200
▪ Zebronics Bijli .....	Rs 1,200
▪ OCZ Vanquishes AMD Edition (Optional).....	Rs 1,200
<b>Total.....</b>	<b>Rs 16,400</b>

## Mid End System, around Rs 20,000-27,000

▪ AMD Phenom II X2 550 Black Edition .....	Rs 4,900
▪ Biostar T790GXBE .....	Rs 4,400
▪ 4GB Gskill PI Black DDR2 800 MHz RAM .....	Rs 3,400
▪ Western Digital 1TB Green Hard Disk.....	Rs 4,200
▪ Samsung/LG/Lite On DVD Writer.....	Rs 1,200
▪ Corsair CX400   Seasonics 380W SMPS .....	Rs 3,200
▪ Antec 300 Cabinet.....	Rs 3,400
▪ Thermalright Ultima 90.....	Rs 1,900
▪ Scythe Sflex 65cfm 120mm fan .....	Rs 500
<b>Total:.....</b>	<b>Rs 27,100</b>

## Mid End System Alternatives

- AMD Athlon II X4 620 Quad Core..... Rs 5,500
- Coolermaster CM590 Cabinet .....
- ATI HD4850 | NVIDIA GTS 250 (512MB) VGA adapter.... Rs 7,000

## Mid-High End AMD System

▪ AMD Phenom II X4 955 Black Edition .....	Rs 11,000
▪ MSI GDFX-70 .....	Rs 9,500
▪ OCZ AMD Black Edition Memory 4GB DDR3 1333 MHz RAM.....	~Rs 6,000
▪ Western Digital 1TB Black Edition Hard drive.....	Rs 5,400
▪ NVIDIA GTX 260 .....	~Rs 10,000-11,000
▪ Samsung/LG/Lite On DVD Writer.....	Rs 1,200
▪ Corsair TX650   HX620 (modular) SMPS .....	~Rs 6,500   ~Rs 8,000
▪ Lancool PCK62 Cabinet .....	Rs 7,000
▪ Thermalright Ultra Extreme Black .....	Rs 3,400
▪ Sycthe Sflex 75Cfm 120mm.....	Rs 500
<b>Total:.....</b>	<b>Rs 60,500</b>

*Continued on next page...*

heating up uselessly and reduces the electricity consumption. In the course of overclocking, we will be disabling CnQ if you have an AMD processor.

- **AMD C1E:** AMD C1E is a power management feature that suspends the system once it is idle.
- **Intel SpeedStep:** Intel SpeedStep is similar to AMD CnQ. Likewise, it reduces the system's power consumption by lowering the processor speed, when not in use.

Once you have disabled all the energy efficient techniques, it's time to start our business.

Overclocking generally depends on the motherboard's capacity and capabilities; the better the motherboard, the better the processor will overclock. Of course, you need a capable processor, nonetheless.

To begin with, head on to the overclocking section of your BIOS (refer to the BIOS manual to locate this) and increase the FSB/HTT/BCLK by 2-5. If you have a special edition processor, then increase the multiplier by 1 from the default and save it. Return to Linux, and run the stress-testing program (we will learn about this later). If you have no errors or system performance issues, it means you have attained a stable overclock. Slowly and steadily, increase the value until you get to the point where the system stops responding. Kindly note, we have not yet increased the voltage of the system.

Once you have reached the limit, it's time to increase the voltage. A word of caution: Do not escalate the voltage value or you might end up with a fried CPU! Start by increasing from 0.05V and then continue increasing the BUS speed/multiplier till you get the maximum stable speed. Note: do not increase the voltage if you're using the factory shipped heat sink to cool the processor. Those cooling solutions are barely enough to cool the factory-shipped system, and increasing voltage on the default cooler might result in a dead processor. See the box titled 'After-market heat sinks' to get an idea



of the range of coolers that you might consider.

For a 65nm/45nm processor, you should aim for at least a 300-400 MHz stable overclock on stock cooling, while people with good cooling should aim for 600 MHz or even 1GHz.

Once you have attained a stable clock, keep it running 24x7 and notice the temperature while stress-testing; make sure it doesn't cross the maximum temperature allotted by the CPU manufacturer.

## Stress testing/Prime95

Prime95 is the only efficient stress-testing program available for Linux, although the Linux version doesn't have a GUI. This test stresses the components and thus reveals any frailty. A stress-testing program stresses the CPU by upping the load to 100 per cent of the CPU cores. The processor will thus be overworked and the temperature will rise. If the overclock attained is unstable, the system might restart or stop responding while stress testing. This is a great way to check the stability of the system after overclocking.

## Factors that affect overclocking

Even if you are well versed with the overclocking techniques, there is no guarantee that you will get the same results. Overclocking depends and varies with situations and the types of hardware components you use. So, I'd recommend extensive research before buying any of these components.

Let's take a quick look at what we should focus on before buying our hardware. Note that the dealers, most of the time, are uninformed and often have vested interests when they promote a product. So, do your homework on hardware peripherals before you buy them.

## Conclusion

The benchmarking scenario is slowly and steadily improving in Linux. However, the clear lack of software potpourri does hurt. None of the programs tested provide an unblemished experience. For starters,

Continued from previous page...

System buying guide

Mid-High End Intel System

- Intel Core i5 750 (LGA 1156) ..... Rs 11,000
- Gigabyte P55 UD3R ..... Rs 13,000
- Corsair XMS3 4GB DDR3 1333 MHz RAM ..... ~Rs 6,500
- Western Digital 1TB Black Edition Hard drive ..... Rs 5,400
- NVIDIA GTX 260 ..... ~Rs 10,000-11,000
- Samsung/LG/Lite On DVD Writer ..... Rs 1,200
- Corsair TX650 | HX620 (modular) SMPS ..... ~Rs 6,500 | ~Rs 8,000
- Lancool PCK62 Cabinet ..... Rs 7,000
- Prolimatech Megahalem + LGA1156 Mounting Bracket ..... ~Rs 4,200
- Scythe Sflex 75cfm 120mm ..... Rs 500

**Total: (with HX620 SMPS)..... Rs 65,300 | Rs 66,800**

Mid-High End Alternatives

- ATI Radeon HD4890..... ~Rs 10,000
- AMD – AMD Phenom II X4 965 Black Edition.....Rs 13,000
- Intel – Intel Core i7 860 ..... Rs 14,000-15,000


High End System

- Intel Core i7 920 (LGA1366) ..... Rs 15,000
- Gigabyte EAX58 UD5p ..... Rs 18,000
- Corsair XMS3 6GB DDR3 1333 Triple Channel RAM ..... Rs 9,000
- Western Digital 1Tb Black Edition Hard Drive x2 ..... Rs 11,000
- ATI HD5850 ..... Rs 17,000
- Samsung/LG/Lite On DVD Writer ..... Rs 1,200
- Corsair TX750W SMPS ..... Rs 9,000
- Lian Li A71F Cabinet ..... Rs 16,000
- Prolimatech Megahalem..... ~Rs 3,500
- Scythe Sflex 75cfm 120mm ..... Rs 500

**Total:..... Rs 100,200**

**Note:** All prices mentioned are courtesy [deltapage.com](#), [theitwares.com](#) and [primeabgb.com](#). The prices are quoted in INR and would vary depending on dealer discounts and product availability.

there are no overclocking software for CPUs, while there are a bunch of overclocking utilities for GPUs. The NVIDIA Control Panel does allow you to increase the memory and core speeds, while the AMD Overdrive is stagnating with no GUI on top. The lack of proper voltage and temperature measuring utilities is getting to be a sore point. Even with LM\_Sensors and many other sensors, temperature monitoring isn't as precise as it should be.

Nonetheless, the benchmarking scenario is improving and will continue to do so since there is a sudden shift towards Linux. Stay tuned. 

By: Shashwat Pant

The author is a FOSS enthusiast interested in QT programming and technology. He is fond of reviewing the latest OSS tools and distros.



# Make Your Own Media Centre

*...in Under Rs 30,000*

Sounds too good to be true? Read on to find out how to make your LCD/plasma TV so much more interesting that you'll forget you have a job.

*H*ave a large screen TV? I'm talking about full HD LCD or plasma models. If you do, you'll see that TV broadcasts all over India (even in DTH services) are broadcast only in 720p (excepting some HD broadcasts on Reliance BIG TV and Sun Direct). What a waste! And so, with only Blu-ray delivering true HD content, it looks like all those 1080p pixels are going to waste.

But wait! What if you replace your Blu-ray player with a computer and a HDTV tuner card? Suddenly, things become interesting. Imagine all the things that you can do with it. Play games at very high resolutions! Watch

TV and Blu-rays! Listen to MP3s, watch all those XviD movies, see pictures on the TV instead of on the computer or the crammed LCD of the camera, get weather info, synopses of the movie that you are watching, IMDB ratings, cover art...

It looks like this dream is set to become a reality!

## The hardware

I presume you already have a HDTV that can connect via HDMI. It would also be an added bonus if you have a 7.1 or at least a 5.1 speaker system.

Okay! Time to list out some hardware:

- AMD Athelon II X2 240, 2.8GHz
- GIGABYTE GA-MA785GT-UD3H motherboard (AMD 785G chipset)
- Transcend JetRAM DDR3-1333 2GBx1
- Nvidia GeForce 9400GT 1GB (more on this, later)
- Western Digital Caviar 7200RPM 1TB SATA hard drive
- Lite-On iHES208 Blu-ray Reader/DVD writer

This entire thing should cost you around Rs 21,000.

The Blu-ray drive costs Rs 8,200, but is a pain to procure in India. If you can't find it, Sony has one that costs Rs 16,000 (just double Lite-On's price). I went with Nvidia's 9400GT (the 1GB model) because at this moment, Linux support for AMD/ATI's Avivo HD is a bit unpredictable, whereas Nvidia's VDPAU works like a charm. On the other hand, if you plan to dual boot Windows and play Crysis at 1080p, you'll need to put in a 1GB ATI Radeon HD4870, which is a heat factory and costs Rs 14,000.

The next part of the shopping list includes the materials for our TV and remote controls: Hauppauge WinTV-HVR-1800 D/A HD TV tuner card (it's a bit on the higher end).

It's difficult to recommend a specific remote to control your computer with, as remote control availability matters. If all else fails, you can get an IR receiver and use your Tata Sky remote rather creatively, training LIRC manually to recognise your remote. Why do you need a remote? When you are using your media centre app, you wouldn't exactly like using a mouse and a keyboard from your couch...

The TV tuner is an analogue/digital HDTV tuner, which can receive signals from normal coaxial cable connections (analogue) or your set-top box as well (digital). Additionally, it has an FM tuner. Enjoy...

You'll need a keyboard and mouse as well—try laying your hands on the Microsoft Wireless Desktop Combo 800, because at Rs 1400, a wireless mouse and keyboard with a 10 metre range is a steal.

As for a case, naturally, since it's going to lie in front of your living room TV, you'll want something pretty; preferably lying down, rather than a tower case. However, please don't go overboard, because the Nvidia card needs a bit of cooling, as does AMD's processors. You may want a third-party SMPS as well—a Corsair VX450 will cost you around Rs 4,100. This ensures better stability.

## Pepping the rig

It's a little difficult to find a Nvidia GeForce 9400GT with HDMI output. Luckily, the DVI connector on the card is HDCP compliant and thus a DVI-to-HDMI cable can be used to connect your TV to the card. The digital signal used in DVI and HDMI is the same, so there is no impact on the quality. However, you won't get any sound on the TV, so you'll need to mute it.

The motherboard has all the audio you can ask for: A 2-channel front panel and a 7.1-channel rear panel. Use



Figure 1: XBMC Home Screen



Figure 2: Playing an HD movie in XBMC

them according to your convenience.

The two PCIe x16 slots are meant for CrossFireX, but single Nvidia cards do not have any problem on an AMD chipset. You won't be able to SLI, however. On the upside, you have a free PCIe x16 slot that can be used by all PCIe cards.

You'll need Internet connectivity on this machine. But due to the lack of a normal UI (GNOME, KDE, etc) you won't be able to connect manually through PPPoE, dial-up or even through a browser. Your connection needs to be 'always-on'.

## A little theory

Okay, here goes. Have you heard of 10-foot interfaces? These are user interfaces that have been designed with large elements that can be comfortably used by people sitting up to 10 feet away from the screen. 10-foot interfaces are almost exclusively used by media centre apps.

And what are media centre apps? Technically, they provide a homogeneous 10-foot interface that represents a uniform way to access all the digital media in the computer, either in hard disks or any removable media. One of the best media centre apps in Linux is the Xbox Media Center, or XBMC. A review has been published in *LFY* recently, and this article puts it to good use.

Technically, your plasma (or LCD) screen is just a monitor as far your PC is concerned. To be able to run XBMC, your TV must support either 720p, 1080p or any standard VGA resolution. Support for interlaced



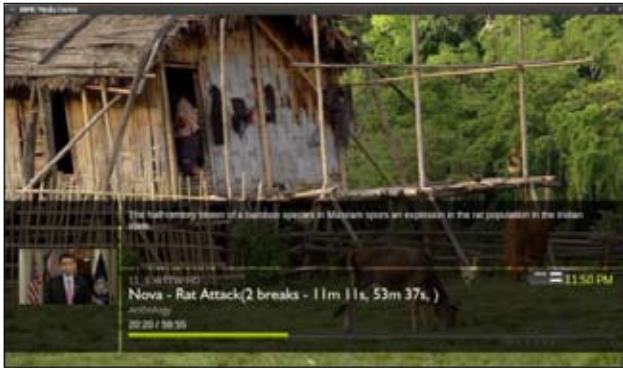


Figure 3: Commercial Break Tagging on MythBox



Figure 4: MythBox's Watch TV Interface

resolutions (720i and 1080i) is rather flaky at the moment.

One last hurdle is that if you have a DTH service, chances are your set-top box connects to your TV through component (Y/Pb/Pr) cables (3-plug adapters). Even if your TV tuner card supports this type of input, support on Linux is flaky, or even non-existent in some cases. Also, since there is no way to change channels using the computer—it must be done on the STB—you'll have trouble doing scheduled recordings. So I'd recommend connecting the STB separately — directly to the TV (keep the STB on A/V, while the computer is on HDMI).

## Setting up the mammoth

First of all, you might try christening this media centre. XBMC 9.04.1 is codenamed Babylon, so you could try christening the PC Mesopotamia ;-) Anyway, once you have set up the hardware, start up the PC and install Ubuntu 9.04 on it. It doesn't matter whether you are using 32- or 64-bit, but 64-bit should give better performance.

Something you might try doing is keeping three separate partitions and mounting them under `/XBMCVideos`, `/XBMCMusic` and `/XBMCPictures`, and then dumping your movies, songs and pictures into them, respectively. It keeps the stuff in one place, and that helps in organisation. Remember you won't be able to browse for files on these machines, you will only be able to see your media repositories (folders that you designate) and removable drives.

You'll need up to 60GB of `/tmp` space because in case your Blu-rays are encrypted, the entire disk has to be decrypted and copied over until you can watch it.

Once Ubuntu is installed, install the Nvidia drivers by typing the following command in a terminal:

```
sudo apt-get install nvidia-glx-180 nvidia-settings
```

After that, enable the drivers from *System*→*Administration*→*Hardware Drivers*, and reboot the system. You should now get the maximum resolution that your TV supports (hopefully 1080p). Bingo! The first segment of the project is complete.

Now install all the multimedia codecs by typing in the following:

```
sudo apt-get install gstreamer0.10-{lame,ffmpeg,fluendo-mp3} \
gstreamer0.10-plugins-{bad,ugly}
```

That will pull in all native back-ends as well as the FFMPEG back-end (which enables use of libavcodec), so you can now play all media formats without exception.

Update all the software by running the following code.

```
sudo apt-get update && sudo apt-get upgrade
```

It's time for XBMC. Go to *System*→*Administration*→*Software Sources*. Switch to the *Third-Party Software* tab and press *Add*. Type in:

```
deb http://ppa.launchpad.net/team-xbmc/jaunty-ppa/ubuntu jaunty main
```

You'll get a warning saying, "Since GPG keys were not found the packages downloaded from this repo cannot be verified." I don't really care about this so I don't add GPG keys; however, if you so wish, the details are at their PPA page.

Now press *Alt+F2* and type in "apt:xbmc" at the box. Get a cup of coffee while XBMC gets downloaded and installed.

Great! XBMC is now installed. Go to *Application*→*Sound & Video*→*XBMC Media Center* and watch it start up.

The first time might be a rather disappointing start, since XBMC is running windowed. Go to *Settings*→*Appearance* and then *Screen*, and change the resolution to your screen's resolution—either 720p or 1080p. That'll take care of things. If it doesn't, exit XBMC, press *Alt+F2* and run "xbmc -fs". That should sort out the problem.

The next thing to do is browse to *Music*, *Pictures* and *Videos*, and add the sources that were discussed earlier. Now, once you copy your media to these folders, you will be able to browse to them from the interface.

That's almost all. There're some small details left. Setting up LIRC is left to the user, however, as remote settings are unique for every model.

## The idiot box

Time for the telly. This will only work if you have a normal analogue cable connection, not if you have DTH. Anyway, let's go...

First of all, install the essential build packages:

```
sudo apt-get install build-essentials linux-headers
```

Now, download the tuner drivers from <http://linuxtv.org/repo/>, and extract the tarball somewhere. Get into the directory from a terminal and issue the following code:

```
make
sudo make install
```

Notice that there is no configure step here.

Now, download the card firmware from <http://steventoth.net/linux/hvr1800/>. Download at least the zip file and the extraction shell script, and run the script. Two `.fw` files should be extracted. Copy these to `/lib/firmware`.

Now reboot the machine to achieve a clean state, and then run the following code:

```
sudo modprobe {cx23885, tuner}
```

If this stage goes well (you should investigate the `dmesg` output), the tuner now officially works under Linux. The next step is installing MythTV and integrating it with XBMC, so you can use your XBMC interface to watch and record live TV.

Type the following command to download and install MythTV:

```
sudo apt-get install mythtv
```

First, MythTV needs to be configured. No instructions, sorry! There're too many variables to be considered here. The device node for your TV tuner card is `/dev/video0`. To watch TV, you need to manually scan the line for all frequencies that have channels (the frequencies depend on your local cable company). Then you need to key in channel numbers and names manually. Getting hold of an EPG (Electronic Program Guide—the stuff that shows schedules) is also difficult, but you can find some on MSN, which I'm not sure is MythTV-compatible. You need an EPG though—or else Mythbox won't work.

Use this Web resource to help configure MythTV: [http://parker1.co.uk/mythtv\\_ubuntu.php](http://parker1.co.uk/mythtv_ubuntu.php). Although it's not for India, most of the stuff described in there does apply. And it's a long document, mind you.

After you have done all the configuration in MythTV (make sure it works exactly as you intend—you need to be able to watch channels and use the EPG perfectly), it's time to hook up MythTV to XBMC, and turn the media centre into a TiVo as well.

Execute the following code:

```
sudo apt-get install ffmpeg python-mysqldb
```

Then, head to <http://code.google.com/p/mythbox> and download the latest tarball. Extract it into `$HOME/.xbmc/scripts`, like:

```
cd ~/.xbmc/scripts
tar -xvzf /path/to/mythbox-svn-1260.tar.gz
```

Start up XBMC again (use `Alt+F2`, then run `xbmc -fs`; you need to be in full screen). Now go to *Scripts* → *MythBox*. You'll be sent into a *Settings* screen. Fill in your settings — mostly database settings—and if you just can't get MythBox to authenticate, use 'root' as the user name and the root password (the MySQL root password that you supplied when you were setting up MythTV). Now go to *Test Settings*. If *Settings OK* comes up, exit the settings screen (Press `Esc`), and enjoy Live TV. You can even schedule recordings. To get into MythBox, go to *Scripts* → *MythBox*. Now instead of going to the settings screen, you will be taken to the TV console. Enjoy!


## Final touches

Finally, it's time to get it all started silently. First of all, go to *System* → *Administration* → *Login Window*. Type in your password, and then go to the *Security* tab. Here, enable auto-login, and select the appropriate user to log in as. This should ensure that you do not have to type in your credentials to start using the media centre.

The next thing to do is make XBMC start up automatically. Go to *System* → *Preferences* → *Startup Applications*. Hit *Add*. Type in anything in the *Name* field. Type in `xbmc -fs` in the command field. Click *Add*, and then *Close*.

Now reboot your media centre. Voila, it boots straight into XBMC!

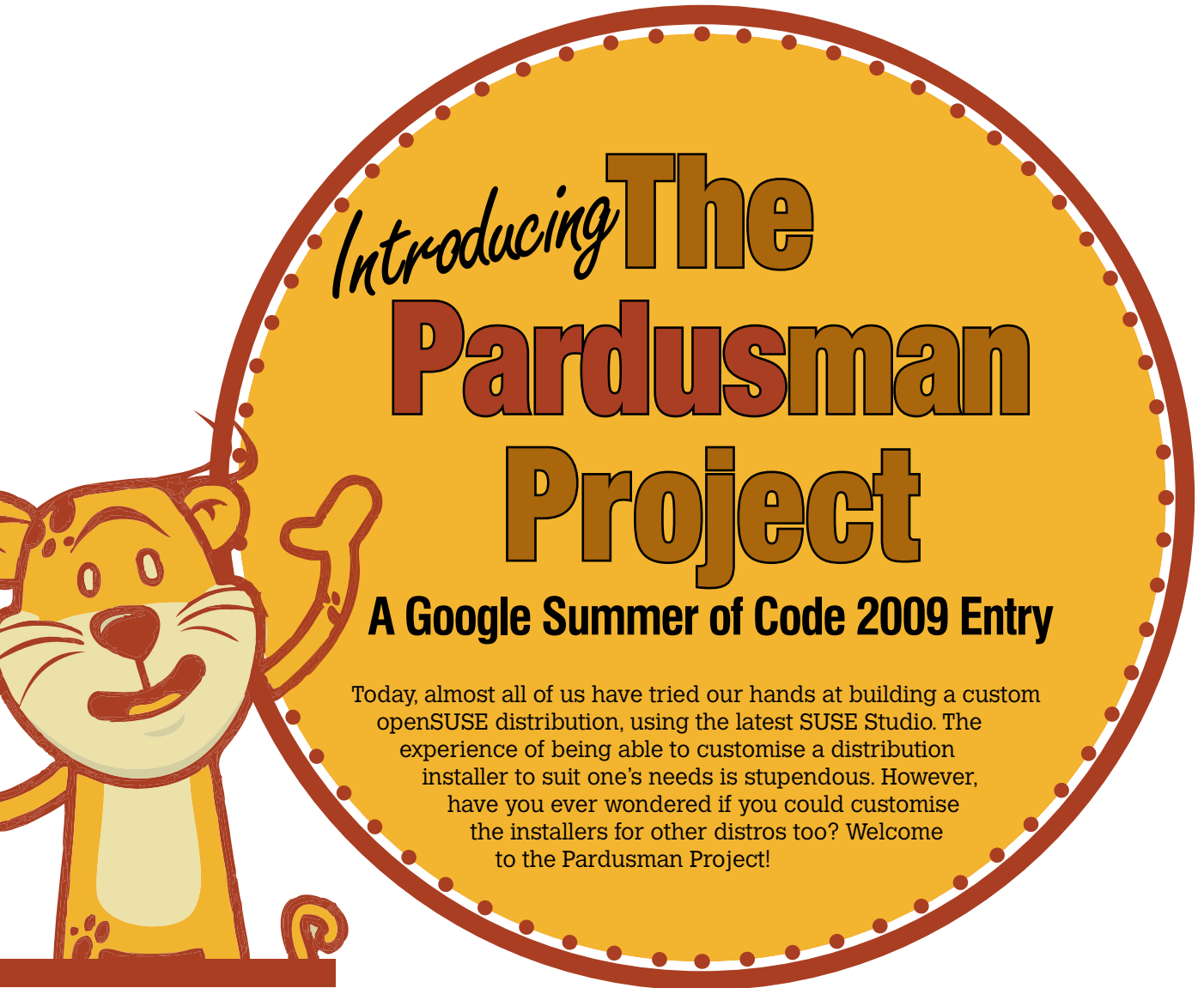
## Anything else?

Sure, why waste such a good piece of hardware? Besides running XBMC, which is using up all your GPU power, you can run an Icecast server in the background to stream your music over Wi-Fi, or use VLC to stream videos as well. This makes good use of the leftover processing power. Yes, with that 1TB hard disk, you can sure store all your H.264 movies, music and pictures, and still have some space left, so why not use it as a home server? Innovate, while I try out my TV-less XBMC set-up. (Yes, I don't have a tuner because I use Tata Sky :-))  **END**

**By: Boudhayan Gupta**

The author is a 15-year-old student studying in Class 9. He is a logician (as opposed to a magician), a great supporter of Free Software and loves hacking Linux. Other than that, he is an experienced programmer in BASIC and can also program in C++, Python and Assembly (NASM Syntax).

MythBox screenshots are courtesy: <http://code.google.com/p/mythbox/wiki/Screenshots>



Today, almost all of us have tried our hands at building a custom openSUSE distribution, using the latest SUSE Studio. The experience of being able to customise a distribution installer to suit one's needs is stupendous. However, have you ever wondered if you could customise the installers for other distros too? Welcome to the Pardusman Project!

Google Summer of Code (GSoC) is one of Google's important programmes that encourages open source development and contribution. This event, first held from May to August 2005, is an annual programme. Through these few months every year, Google awards stipends to hundreds of students who successfully complete free and open source coding projects that have been requested for. The programme is open to students aged 18 and above.

Although it's dubbed the Summer of Code, I would say it's more about passion than code. A piece of code is just a written expression of the passion, anyway.

Being a student developer, it means a lot

to us when speaking about our Summer of Code experience. Every year, Google selects around 1,000 student developers, from around the world, assigned to different open source projects. See [code.google.com/soc](http://code.google.com/soc) for more.

This was my second GSoC. In 2008, I participated in a Fedora project. And in 2009, I worked with the Pardus Linux project. Pardus is a nicely built and user-friendly GNU/Linux distro from Turkey, developed and maintained by TUBITAK (The National Scientific and Technological Research Council of Turkey). My project was to create a Web-based ISO image creation tool for Pardus and I was mentored by Ekin Meroglu, core developer and project administrator, Pardus Linux Project.



## A background on Pardus

Pardus, as a GNU/Linux distro, is known to be user-friendly, sleek, simple and spicy with lots of custom configuration tools written by the Pardus team. The distro is not based on any of the traditional base distros like Debian or Red Hat. It's completely written from scratch. The package management tool is PISI. The distro makes use of lzma compression for packages and also supports xdelta-like techniques to make fetching packages for installation, faster. Pardus has developed its own core libraries and APIs to develop different applications on the Pardus platform.

Personally, I have been fascinated by Pardus for the last two years. Its boot speed is what I found to be the most impressive. This had prompted me to dig into the initrd/init boot scripts. I found it interesting that all system configs and automation scripts (traditionally written in Bash) have been replaced by Python. Even before Ubuntu's fastboot technology Upstart came out, Pardus' init was much faster.

## What's my project about?

We have numerous variants of GNU/Linux (popularly known as distributions or distros) for different purposes. When we go for a distro install, we receive a base system with a standard set of applications bundled along with them. To make the OS work to our likes and specs, we need to install another set of packages that cater to our working domain or interest. Also, it requires setting up themes, wallpapers, copying our own files to the home directory, etc.

My project aimed at bringing out a Web-based distro 'cooker'. Users should be able to create their own custom distro builds by providing numerous custom options ranging from wallpapers to package selections. By locating the URL of this distro cooker (let's call it Pardusman), we could do the following customisation, using a simple Web interface:

1. **Home Page**
  - Sign up for a user account
  - Sign in to Pardusman
2. **Distro type**
  - Select the distro type: Live CD or Install CD? If it's Live, specify the user name, password, and host name
  - Provide a build project name
3. **Repository:** Select the package repository from the Pardus servers, to be used for the build.
4. **Languages:** Select language support to be included, besides setting the default language.
5. **Upload**
  - Upload a *RELEASE* file (i.e., a text file that appears in the *root* of the CD-ROM that contains some notes on the build).
  - Upload the contents of the home directory.
6. **Packages:** A package tree widget will appear. Packages



Figure 1: Sign-in



Figure 2: Distro type

are classified as different components according to their group. For example, the GIMP and Inkscape are other graphic tools included in the package group 'multimedia-graphics'. By using a drop-down tree element, we access the packages under a package group and select the check boxes in order to include them. We can even include all packages in a package group by checking the group itself. Also, there is a search option available to look for packages. All the packages from the selected Pardus repository will be listed in the packages widget. There is also an option to calculate size—on clicking the Calculate button, you can get the total size for the build.

7. **Wallpaper:** You can either select the default option from the list of wallpapers, or upload your own.
8. **Media Selection:** You can select the required image output. For example, an ISO image, or virtualisation images like VMWare, Qemu, Virtualbox, etc. Once you have completed the wizard, you can submit



Figure 3: Repository selection



Figure 4: Package selection widget

the configuration for distro building. It will be processed by the *buildfarm* queue underlying in the Pardus server. You can check back after a few hours and look into the 'user log' page to get the status of the build you have requested, the link for download, the link to the project file and the Pardusman log file. Also, a history of all builds you have ever made.

## Getting started

I started my work with UI (user interface) design. I worked out the basic pages and their structure. Then I designed these using Inkscape and published them on my blog for feedback. As it happens with FOSS projects in general, I too got a lot of feedback. In fact, one of my good friends (Hiran) helped me give the finishing touches to the final set of images I required for the front-end UI.

Typically, a project has several development versions of the same app while coding. Under the

circumstances, the manual way of backing up the code makes everything complex and difficult. Sometimes this even leads to loss of data/code. So, it is always advisable to use some kind of version control system (VCS) to keep track of code.

Git is one of the best version control systems available. I decided to go with Git, synced with *github.com*, where several FOSS projects are housed. You can pull the latest copy of Pardusman, using:

```
$ git clone git://github.com/t3rm1n4l/pardusman.git
```

Coming back to the UI elements, my next job was to create the set of Web pages using HTML and CSS. I scripted each page to complete the Web wizard described earlier. My template was now ready.

However, since the wizard, whose purpose is to collect data from a user, consists of several pages, it required transition from page to page. Page-to-page transitions were in traditional styles and not of Web 2.0 standards. So, I decided to use *div* containers, which can dynamically load HTML content using AJAX. This made the requirement for refreshing and loading new pages through URLs, redundant.

jQuery is a rich open source JavaScript library that helps to implement AJAX methods and calls using its rich in-built functionalities. I could easily implement the dynamic loading of pages and simple animation effects, using jQuery.

Once the templates and basic AJAX loading were completed, I started off with Django, Python's own Web framework. Django is a rapid Web application development platform. It makes it easier to develop complex Web applications in a short span of time. The coding with Pardusman progressed very fast.

The database storage in Django is handled using its own data model object-oriented structures. Initially, I wrote the pages for the user account sign up and sign in. Django was pretty easy to follow and code.

I got stuck with coding while creating a complex package selection widget. A package selection widget consists of a drop-down of packages with components in the top level and check boxes attached to it. It was solved with JQuery hacks. Thanks to the #jquery IRC channel of *irc.freenode.net* for helping me out.

There will be more than one package repository, like *pardus-2008* and *pardus-2009*. By selecting any one of them, we can build either a Pardus 2009 or a Pardus 2008 distribution. Dynamically producing the package information and bringing it to the packages widget causes overheads and puts a heavy load on the CPU. There might be thousands of packages in the repo and hundreds of users simultaneously accessing Pardusman, which would surely bring the server down. So I decided to build a static repo package information creator that would be scheduled to update the packages information

every day. The Web application makes use of that static page to display package information.

The next difficult task with implementing the UI was regarding the option of size calculation around the package widget. Once users select the required packages through check boxes, they can calculate the total size for the custom build. The size must be calculated live.

I used the *memcached* server, which can cache data and program objects. But the size of the object to be cached is restricted to 1 MB. I maintained objects of all repositories with package lists and corresponding package sizes in the *memcached* as cache objects.

Once the user clicks the *Calculate* button, it sends the list of selected packages to a Django function in the backend, which accepts the post requests. From the received list of packages, it analyses the package names one by one, and its size is grabbed from the repository *memcached* object.

The backend handles a lot of complex tasks like dependency resolving, which is very interesting. The user selects a set of packages that are required. But they are not the only packages to be included in the distro build. Each package is dependent on some other package. This relation is called dependency.

Each *pisi* package (e.g., *pidgin.pisi*) consists of the data and binary files, along with a meta file that describes all the details about the package. This is an XML file. We can find its dependencies by parsing the XML file.

Each package requires some other package to work. For example, Pidgin requires the following packages to work, which in turn may require some other package to work, thus creating a chain of requirements.

Every time a user requests for a size calculation, it resolves dependencies before calculating the size each time and returns a set of information. Here's an extract from the Pidgin package metafile:

```
<Name>pidgin</Name>
<RuntimeDependencies>
<Dependency>audiofile</Dependency>
<Dependency>gtk2</Dependency>
<Dependency>gnutls</Dependency>
<Dependency>gstreamer</Dependency>
<Dependency>startup-notification</Dependency>
<Dependency>cyrus-sasl</Dependency>
<Dependency>gtkspell</Dependency>
<Dependency>avahi-glib</Dependency>
</RuntimeDependencies>
```

The method of solving this complex loop and calculating the list of net packages that should go with the distro build is known as dependency resolving. It is performed in the Pardusman backend. Take a look at the Pardusman code, which you will find interesting.

The wallpaper selection page relies on JQuery. When a user uploads a picture, it is to be stored in the server,



Figure 5: The 'user log' page lets you download the custom distro you created

and only a thumbnail is to be returned and shown in the list of wallpapers. For resizing the uploaded image to a thumbnail, I have used *imagemagick* in the backend.

The wizard involves seven basic steps. At each step, when the next button is clicked, it sends out the data collected from the current page to the server. This data is added to the browser session using the *request.session* dict object available in Django. Once all the wizard steps are completed, it has to generate a configuration file for the custom distro build making use of all the data provided by the user.

XML is used to represent the project configurations. The commonly used XML parser library in Python is ElementTree. But ElementTree is very slow to meet the requirements of this project. Hence, the Pardus team has ported *piksemel*, a XML parser used by the Jabber protocol, to the Pardus platform. It is a very fast XML parser. The *project\_config* file is generated with the following tree structure.

```
<PardusmanProject type="install" media="iso">
<Title>Test-Project</Title>
<ReleaseFiles>RELEASE.txt</ReleaseFiles>
<Wallpaper>user_wallpapers/wallpaper_R6wL4i.jpg</Wallpaper>
<UserContents>user_contents.tar.gz</UserContents>
<PackageSelection repo="Pardus-2009">
<SelectedComponent>x11-server</SelectedComponent>
<SelectedComponent>desktop-kde-base</SelectedComponent>
<SelectedComponent>x11-util</SelectedComponent>
<SelectedPackage>glitz</SelectedPackage>
<SelectedPackage>libdmx</SelectedPackage>
<SelectedPackage>kdeedu-marble</SelectedPackage>
<Package>less</Package>
<Package>libX11</Package>
<Package>jpeg</Package>
<Package>sysvinit</Package>
<Package>piksemel</Package>
```



```
</PackageSelection>
<LanguageSelection default_language="en_US">
<Language>en_US</Language>
</LanguageSelection>
</PardusmanProject>
```

At the end of the wizard, the config file is generated. The project\_file is designed as a tarball (.tar.gz) with the following structure:

```
Project_file.tar.gz
---+ user_contents.tar.gz ( user home contents )
--- user_presentation.odp
---- RELEASE.txt
---- project.xml
---+ user_wallpapers (wallpaper)
--- wallpaper1.png
```

On generating the project file, it is sent to the Buildfarm Process Queue. Buildfarm is a component of Pardusman that performs the distro builds from the given project configuration file. Buildfarm is run as a daemon that is run all the time. Process Queue maintains the list of distro build requests from users along with the link of the project file generated. There is another queue called the On\_Progress queue, which maintains the list of distro projects for which the builds are in progress.

Distro building is a CPU-intensive process and it requires a heavy hardware configuration to build multiple distros at a time. On my laptop, performing more than two distro builds raises temperatures to very high levels and the laptop gets powered off. So simultaneous multiple distro builds are to be restricted according to the server capacity. Buildfarm is provided with a configuration file through which lots of parameters can be specified. It includes BUILD\_LIMIT = No of builds to be performed at a time.

The Buildfarm\_queue is capable of holding any number of user build requests. The On\_Progress queue is restricted according to BUILD\_LIMIT. Once the build of one project is completed, a project is fetched from the Buildfarm\_queue to the On\_Progress queue and the build will be started.

Users can keep track of the progress of their project build requests through the Userlog page. In the Userlog page, once the user requests for a build and the project is sent to the Buildfarm\_Queue, it will be shown as 'scheduled' against the line that corresponds to a project build. Once the project is in the build state and is inside the On\_Progress queue, it will be shown as 'in progress'. If the project build is successful, it will be shown as 'Completed' and if it fails, will show up as 'Failed'. Once the build is completed, a download link to the image will be provided. It also will list out a Logfile link, which can be used for debugging if the project build fails and can send a bug report or *dugg* with the reasons for it.

There are lots of complex things underlying the Buildfarm component. Explaining those implementation details is not within the scope of this article. Still, I would like to share some of the best features that come with the *pisi* package management tool, which helped me automate the build of the filesystem base easily.

For example, if you want to build a filesystem base in the current directory 'pardus-root', perform the following:

```
# pisi --yes-all -D"/.pardus-root" ar pardus-install http://paketler.pardus.org.tr/pardus-2009/pisi-index.xml.bz2
```

It initiates the directory 'pardus-root' as the root filesystem attached with a repository.

Now we can install packages to this filesystem as:

```
# pisi --yes-all --ignore-comar -D"/.pardus-root" it -c system.base
# pisi --yes-all --ignore-comar -D"/.pardus-root" it <package_name>
```

Did you find any package management tool that is capable of this? Apt, Yum, Emerge...? There are more. Suppose I have a bunch of *pisi* package files in a directory, I can make that directory a *pisi* repository. What do you think?

Change the current directory to the above mentioned directory and execute the following:

```
# pisi ix
```

It will create the index file pisi-index.xml and pisi-index.xml.bz2

Now you can add the directory as the repository, using:


```
#pisi ar 'repo-name' ar <directory_path/pisi-index.xml.bz2>
```

That is all about the essentials of Pardusman. We are setting up Pardusman on the official Pardus server for all of you to master your own custom Pardus builds. Keep yourself updated with <http://pardusman.pardus.org.tr>.

I have already set up the Pardusman wizard right there. The Buildfarm component is not yet initiated as the daemon. The Pardus team will run the Buildfarm soon. Hence you can have your own distro versions of a custom-built Pardus, with your own wallpaper, packages, home folder contents and a lot more.

Grab the code at [http://google-summer-of-code-2009-pardus.googlecode.com/files/Sarath\\_Lakshman.tar.gz](http://google-summer-of-code-2009-pardus.googlecode.com/files/Sarath_Lakshman.tar.gz)

Enjoy Pardusman. Get, set and burn!

Happy hacking!  **END**

**By: Sarath Lakshman**

The author is a Hactivist of Free and Open Source Software from Kerala. He loves working on the GNU/Linux environment and contributes to the PiTiVi video editor project. He is also the developer of SLYNIX, a distro for newbies. He blogs at [www.sarathlakshman.info](http://www.sarathlakshman.info)



Attention Programmers! Improve your tech skills and win prizes.

**W**elcome to the first installment of CodeChef Challenges—your monthly dose of puzzles from India's biggest online programming contest, now in print! Compete with like-minded folks who are as passionate about programming as you are. Each month, we will bring to you a CodeChef challenge that will test your tech skills, and the top entries will be awarded by *LINUX For You* and Directi.

### What is expected out of you?

Every month we will share with you a CodeChef puzzle that you should solve and revert to us at [codechef@efyindia.com](mailto:codechef@efyindia.com). Three lucky winners can win Rs 1000 each, every month.

Ready? Here goes the first of many!

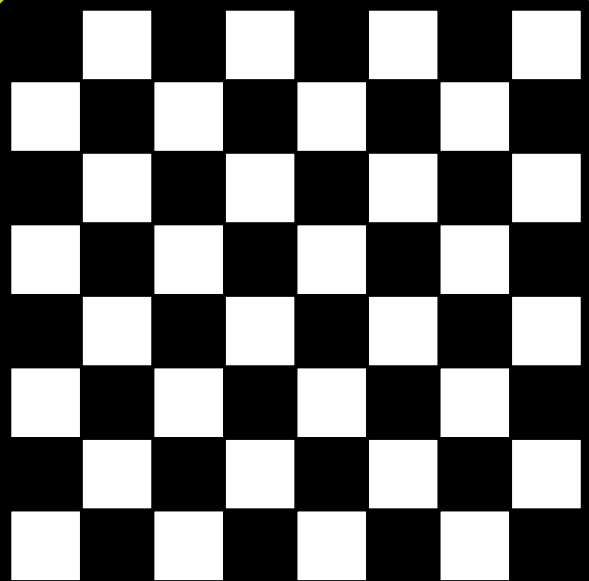
### Puzzle of the month

How many squares of different sizes, and with sides parallel to the sides of the chess board, can we get from an  $8 \times 8$  chess board?

Send in your answers to [codechef@efyindia.com](mailto:codechef@efyindia.com), latest by November 18, 2009. Watch this space for the winner, solution to the puzzle, and another exciting challenge. Till then, happy programming!

Want tougher challenges? Bigger prizes? Check out [CodeChef.com](http://CodeChef.com)

[CodeChef.com](http://CodeChef.com) is India's first, non-commercial, online programming competition, featuring monthly contests in more than 35 different programming languages. CodeChef has been created by Directi, as a way to continuously challenge and engage the developer community. The goal is to provide a platform for practice, competition and improvement as well as enable developers to benchmark their skills against their peers. **END** 



# Electronic Design and Fabrication with

# gEDA

Learn how to design and fabricate cool electronic gadgets.

*H*ave you ever wondered how electronic gadgets are designed? The heart of these gadgets is a certain circuit board(s) in a nice shiny cabinet. But how does one design these circuit boards? Resistors, capacitors, transistors, etc., are all brought together in a circuit board to perform a greater function. This article gives a brief description about the tools for electronic design in GNU/Linux.

## What is EDA?

EDA (Electronic Design Automation) comprises a set of tools for electronic design. EDA applications are used by circuit designers to design and produce electronic systems. EDA tools are for low- to medium-complexity printed circuit board (PCB) design. A basic EDA tool takes care of the following functionalities:

- Schematic capture
- Netlist generation
- Simulation
- Printed circuit board (PCB) layout
- PCB testing
- PCB fabrication

## What is gEDA?

Although most popular EDA tools are proprietary in nature, in this article we'll introduce you to gEDA that is basically a set of GPL'd tools for EDA design, and these applications are collectively referred to as the gEDA Suite. gEDA is pronounced 'g-daahhh' or 'gee-daahhh'. The gEDA project is also known as gaf (for 'gschem and friends').

The gEDA project was started by Ales Hvezda on April 1, 1998, and it included a schematic capture program and a netlister. At present, this project features a complete suite of free software applications for electronics design, which includes: schematic capture, a bulk attribute editor, a bill of materials (BOM) file generator, a design rule check (DRC), a 20 file format netlister, an analogue and digital simulator, and a printed circuit board (PCB) designer. Refer to Tables 1 and 2 for tools that are part of gEDA.

That's a huge list, wouldn't you agree? But what's the use of so many independent tools? Usually, hardware designs are not done using a single piece of software. A series of programs are used for a good hardware design. For instance, in the case of PCB



**Tools that are part of gEDA**

Tool	Usage
gschem	Schematic capture
gnetlist	Netlist generator
gattrib	Attribute editor
symbols	Symbol library
libgeda	Libraries for gschem gnetlist and gsymcheck
gsymcheck	Symbol checker
examples	Example projects
documentation	Documentation

Table 1

fabrication, the following tools are used:

- *gschem* – draws electrical schematic
- *gsch2pcb/gnetlist* – creates netlist
- PCB – reads netlist, draws PCB
- *gerbv* – Gerber checker/viewer

The gEDA project is widely aimed at circuits of low- to mid-level complexity that are geared towards board-level designs.

## Why gEDA?

The first thing that makes it so attractive is its GPL license. gEDA supports a wide range of platforms including GNU/Linux, UNIX, OSX and Windows. Besides these, the following are some of the main attractions:

- File formats are in ASCII text and well documented.
- Command line options help to automate design flows using UNIX tools like make, awk, sed, etc.
- There are no boundaries for design size, number of components, PCB layer count, etc.
- Free from DRM—i.e., you can share your designs and design elements with everyone.

Last, but not the least, is the superb mailing list of the project, where you can find developments, bug fixes and user queries being discussed.

On the downside, there might be some cutting-edge features that you find missing from gEDA. However, the features available are adequate, and more are being added over time.

## Component and symbol library

A good EDA tool requires a wide collection of symbols, which are a simple representation of circuit elements such as resistors, ICs, connectors, etc. This is available in the gEDA library—currently, it numbers approximately 2,000. All these symbols are in ASCII formats so they can be easily edited using text editors. Note that the schematic is a collection of symbols, and thus all schematics have the same format as symbols.

Symbol libraries are always never complete as new components are developed over time. So regular updating of the symbol library is vital. An online collection of symbols is maintained at [gedasymbols.org](http://gedasymbols.org). It's a repository for symbols, footprints and documentation that is useful to

**Separately developed/maintained tools, but associated with gEDA**

Tool	Usage
PCB	Free/open source PCB layout editor
gerbv	Gerber viewer
gnucap	GPL'ed mixed-mode/mixed-level circuit simulator
gnucap+	An extension of the GNU Circuit Analysis package
GTK Wave	Electronic waveform viewer
gwave	Analogue waveform viewer
Icarus Verilog	Verilog simulation and synthesis tool
ngspice	An improved SPICE
gsch2pcb	A tool to forward annotation from your schematic to layout, using pcb
GSpiceUI	Graphical front-end to SPICE/gnucap
wcalc	Transmission line analyser
vhdl2vl	VHDL to Verilog translator

Table 2

anyone using *gschem* and *pcb*. The mission of *gedasymbols.org* is to increase the usage of the gEDA suite. Users who would like to contribute missing symbols can add them to the online library. The updated components/symbols library will be available during its next release.

As with all EDA tools, *gschem* has a symbol editor. You can draw your symbol and save it. You can upload this to [gedasymbols.org](http://gedasymbols.org).

## Draw schematics with gschem

*gschem* is the specialised drawing program for gEDA. The term *gschem* means gEDA's schematic. Usually you'll need

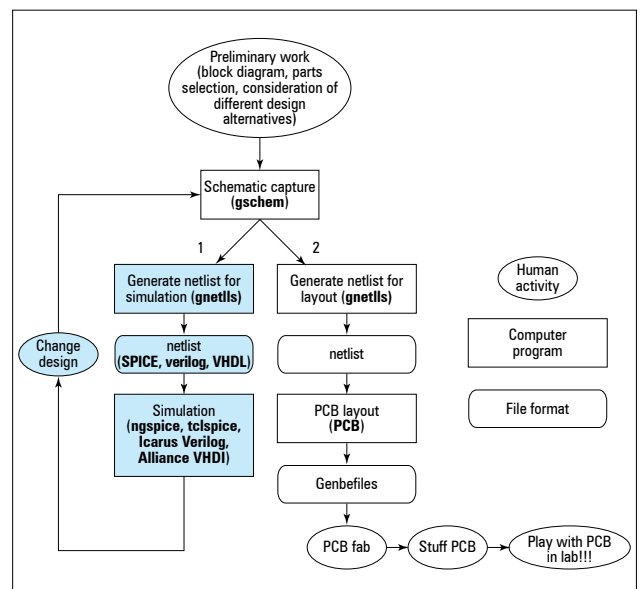


Figure 1: Board design flow using gEDA

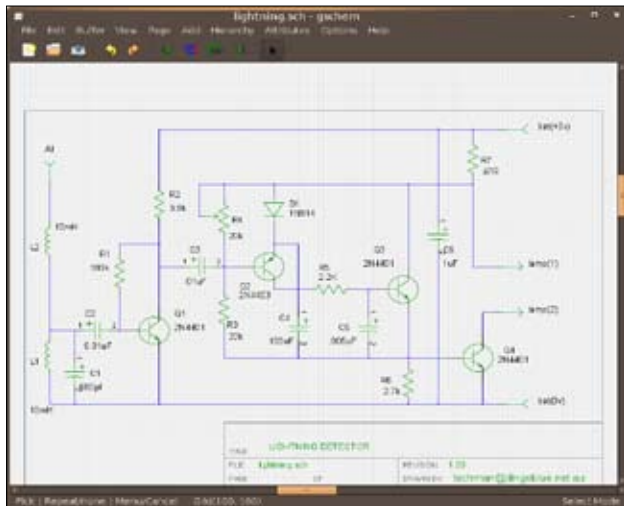


Figure 2: A schematic drawn using gschem

to draw schematics for an electronic design—gschem is for that purpose.

You can invoke it from the command line by typing *gschem*. It will open a graphical application with all the menus and buttons necessary to draw a schematic. You'll find gschem very similar to other EDA programs. Besides, you can easily master it using the tutorials available at the gEDA documentation site (<http://geda.seul.org/wiki>). This tool will give you all the options for wires, component pins, components, etc., that you require for your PCB design.

Since all your files are saved in the ASCII format, scripting languages can easily manipulate these. Thanks to this feature, there are several symbol generation tools that have been made using Python and Perl, besides the footprint generators made using Python. This is in stark contrast to proprietary EDA programs, which lock in users by not supporting ASCII file formats.

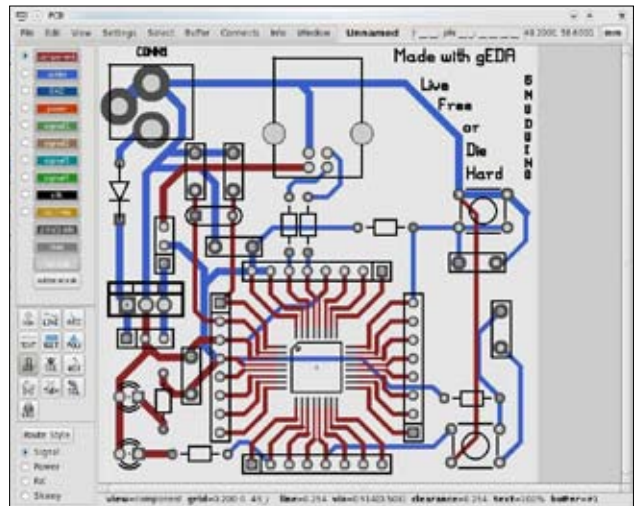


Figure 3: The AT90USB162 mini development board layout made with *pcb*

## Connectivity information using gnetlist

The schematic you prepared using gschem needs a netlist. The term 'netlist' means a net connections list, where the 'net' is the connection between components. The netlist file contains the list of connections between the component pins. The tool for this task is *gnetlist*. In simple words, *gnetlist* is a graphics-to-text converter tool. Netlist information is mainly used by circuit simulators to simulate the schematic you have drawn—as the input to layout programs that typically hold information about each component's PCB footprint, as well as connectivity information between all component pins.

A wide range of around 20 different file formats can be outputted by the netlist. Among these file formats, the SPICE format is popular. These file formats can be used to simulate electrical circuits that are popular among electrical and electronics engineering students worldwide.

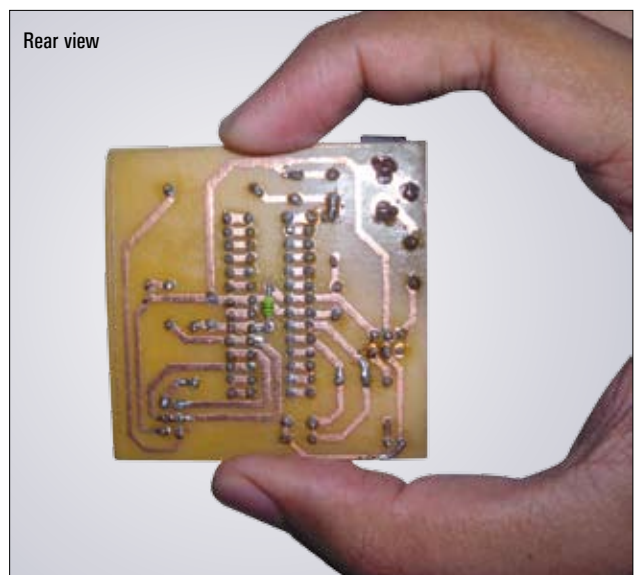
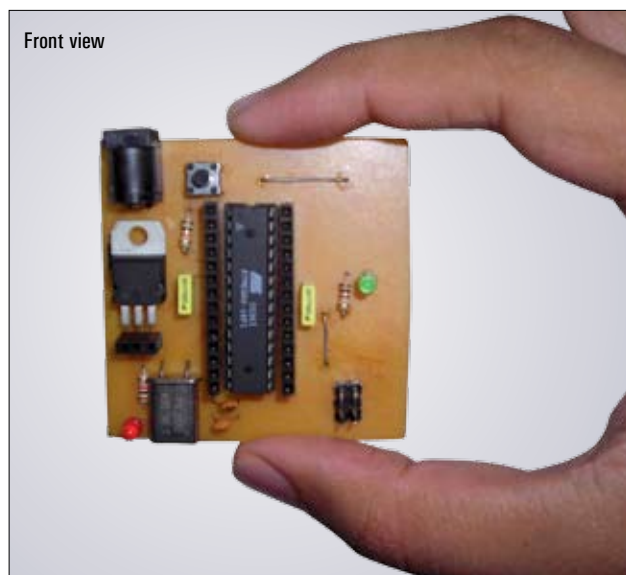


Figure 4: A home-made PCB by the author (ATMega8 mini development board)

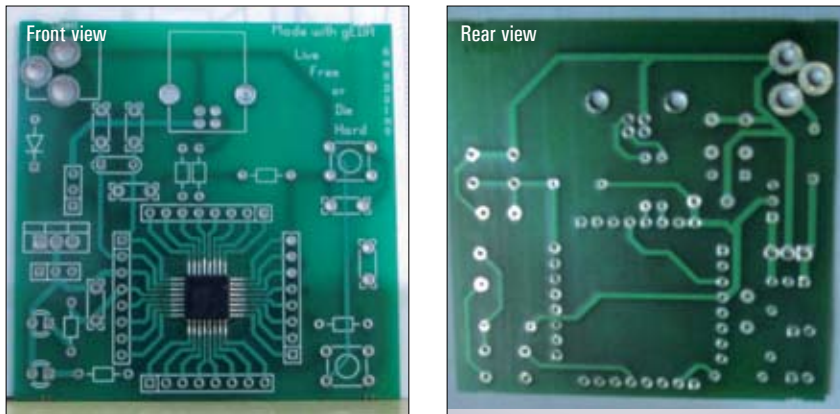


Figure 5: Machine-fabricated board designed by author (AT90USB162 mini development board)

BOM (bill of materials) generation and DRC (design rule checking) can also be outputted from *gnetlist*.

For designing PCBs, the schematic file has to be converted to the *pcb*-readable file format. You can do this using *gnetlist*, as mentioned. However, this is a slightly complicated process. So one of the *gEDA* hackers made a tool called *gsch2pcb* in C. This does the schematic to *pcb* file format conversion, automatically.

## PCB, the layout program

The *pcb* tool helps you draw the wires for a custom printed circuit board (PCB). *pcb* is, in fact, a specialised drawing program to draw metal tracks, components, drill holes and other structures onto your circuit board. Its user interface presents a drawing window accompanied by all the widgets and tools necessary to draw your circuit board.

Designing printed circuit boards using *pcb* is very simple. Place the component footprints on the board, and route the tracks between the pins of the footprint. That's all! You have your PCB ready for fabrication. On the other hand, if you have drawn the schematic using *gschem*, you can use the command *gsch2pcb* to convert the schematic file into a *pcb*-readable format.

*pcb* supports around 16 copper layers, which, I'd say, is quite sufficient for most designs. Also, there is no limitation in the design size, number of components, PCB layer count, etc,

which is an important advantage when compared to other proprietary EDA tools. Other features of *pcb* include a change in track width, importing logos on to the board, auto-routing, etc.

## A complete design

Once the PCB layout is ready, you can export it into a wide variety of formats. If you need to fabricate a home-made PCB, you can take a laser printout and use a hot iron to transfer the PCB pattern to the copper clad board. This method of transferring the PCB layout from a sheet of paper to copper cladding is nicely described online—Google for more information! If you don't have a printer at home, then export the file to the *ps* format and then later to a PDF. Figure 4 shows a home-made PCB that I fabricated.

However, some of the designs might be complex -- the ones for SMD components, for instance. These types of boards are hard to fabricate at home. Under the circumstances, first export the PCB file into a Gerber file format. Then send the Gerber file to a PCB fabricator near your locality. The PCB fabricator uses machines for fabricating boards. The details for the PCB fabricating machine are in the Gerber files. This kind of fabrication generally produces a high-quality board as compared to a home-made PCB, but is much costlier. Figure 5 shows a board fabricated by sending a Gerber file to the PCB fabricator. (Figure 3 shows a PCB design that's

made using *gEDA*.) Compare the quality of the home-made and machine-fabricated PCBs.

There are many big open source hardware projects that use *gEDA* for designing. Some of them include Ronja (Reasonable Optical Near Joint Access), Darrell Harmon's Single Board Computer Project, MINT, etc. There are some projects contributed by the author also.

## Other tools and design flows

Remember that *gEDA* itself is a collection of tools. It contains a wide variety of tools for electronic design, and describing each will take up a lot more pages. And yet, *gEDA* is not the ultimate in electronics engineering tools available for GNU/Linux. There are still a lot more companion projects. Some of these, along with their applications, are described below:

- Gerbv – Gerber viewer
- GnuCap – Next-generation analogue circuit simulation
- Ngspice – SPICE3f5 (analogue simulator)
- Icarus Verilog – Verilog compiler and simulator
- GTKWave – Waveform viewer
- Wcalc – Transmission line and electromagnetic structure analysis



### Links and references

- Official *gEDA* website: [www.gpleda.org](http://www.gpleda.org)
- *gEDA* Wiki Page: [en.wikipedia.org/wiki/GEDA](http://en.wikipedia.org/wiki/GEDA)
- *gEDA* tutorials and projects: [www.delorie.com/pcb](http://www.delorie.com/pcb)
- *gEDA* symbol library: [www.gedasymbols.org](http://www.gedasymbols.org)


### By Jeffrey Antony

The author is a 21-year-old electronics engineer from Kerala, currently enrolled in a PG Diploma in embedded systems at the DOEACC Centre, Calicut. He is a free software and open hardware enthusiast. In his free time he likes to go cycling, listen to music, and work on open hardware projects. You can find more about the author at [www.jeffrey.co.in](http://www.jeffrey.co.in)



# Get A Hold on the Scheduler with CPU Affinity, in Linux

Understanding CPU affinity helps in designing a better application for SMP systems, by binding a certain process to a specific CPU. This article discusses the CPU affinity interface to Linux.

 In a multi-core/multi-processor system, the OS usually distributes different processes on all available processors (CPU) in a way that allows the system to work most efficiently. However, for some reason, you might like to take charge and overrule the kernel's process scheduling to bind your application to a processor/CPU of your choice. This is known as CPU affinity.

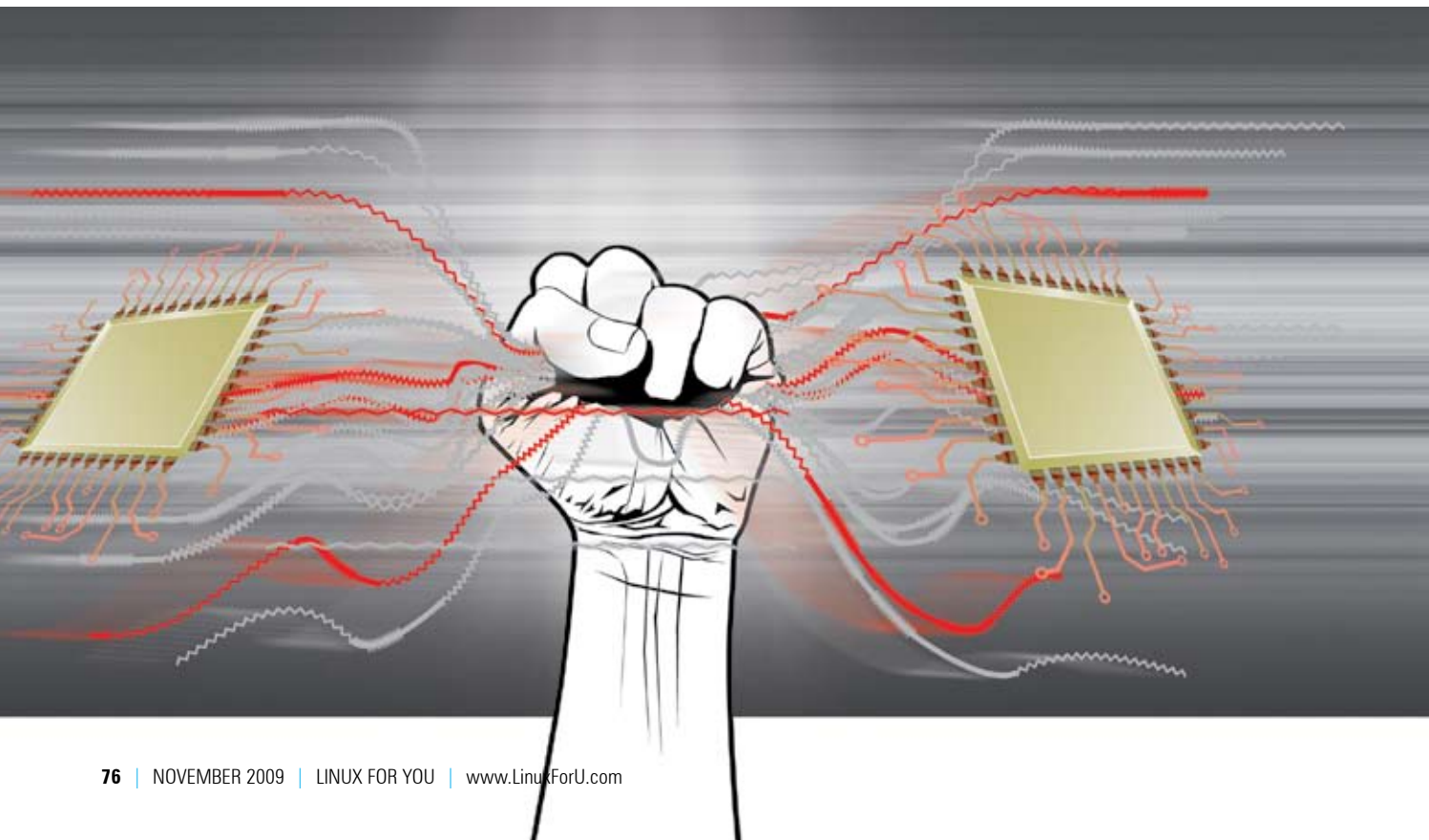
In this article, I will try to cover how a normal Linux user can set/retrieve a specific task's affinity from the command line, and then we will go further with the actual implementation of system calls.

## So, what is CPU affinity?

On symmetric multi-processing (SMP) systems, the operating system's process scheduler not only decides when a process can run, but also where it should run. CPU (or processor) affinity is the term that describes this property of the scheduler to associate a particular process to a specific processor or CPU.

There are two types of CPU affinity that the Linux scheduler supports: soft affinity (or natural affinity), and hard affinity.

The soft affinity of a process is merely an attempt by the scheduler to run the process on the same processor on which it ran the last time. This way the scheduler tries to improve



the performance with the ‘locality of reference’. However, this is not always possible if, for instance, the preferred or ideal processor is busy for further scheduling. The scheduler then migrates the process to a different processor for execution.

On the other hand, hard affinity provides users/programmers the flexibility to override the natural affinity for their tasks/processes. In Linux, all processes are represented by the kernel data structure *task\_struct* that contains fields related to the process attribute. Among these is the *cpus\_allowed* bitmask field that specifies which CPU(s) shall handle the task. This bitmask consists of a series of *n* bits, one for each *n* logical processor in the system. So if a system has four processors (i.e., a multi-processor system), this bitmask will have four bits, and if each processor is a dual core, then it’ll have an eight-bit bitmask.

The default state of a process in Linux for the *cpus\_allowed* field is all 1s. It indicates that the process is allowed to run on any available CPU, and can migrate across processors as and when required.

Hard affinity allows you to alter this bit field. The scheduler then honours it and schedules your task on the processor of your choice. We will soon look at how you, as a user/programmer, can change the affinity.

But let’s first discuss the possible reasons that may lead you to design your application to override the natural (or soft) affinity of the process/thread.

## Why overrule a natural affinity?

Well, the Linux scheduler does a fantastic job of scheduling. It tries to run a process on the same processor it ran the last time, assuming that some remnants of the process may be left (especially the cache) and thus a better performance could be achieved. However, there are various other parameters that a scheduler considers while deciding which processor should run the process.

One of the possible reasons could be that the preferred processor is busy but the other processor(s) in the system is not. Under the circumstances, the scheduler will dispatch the process to the idle processor in order to maintain the load balance.

However, for whatever reason, a program might want to have control over the scheduling aspects of the application. Some of these could be:

- A multi-processor system needs to keep the processor’s caches valid. Data must be modified by only one processor, and all other processors that have cached the same data must invalidate their copy and fetch the most recent data again in case of a cache miss, and they do so. This may come at a high cost in terms of performance. Now think of a situation when a process starts bouncing between different processors. This will constantly cause the cache to get invalidated. And the situation may even worsen, if the threads of a process are scheduled at discrete processors and they are perpetually accessing and updating the same piece of data. This will lead to the frequent invalidation of the cached data. Here,

hard affinity will rescue you from such performance degradation by letting you schedule your application on the processor(s) of your choice.

- In NUMA (Non-Uniform Memory Architecture) machines, processors will have faster access to local memory than shared memory between different processors. Therefore, forcing a process to the processor that has local access to the frequently used memory helps in boosting the performance.
- Sometimes real-time applications require a dedicated processor. With hard affinity you can ensure that a long-running and time-sensitive application runs on a specific processor.

Linux kernel 2.6 provides complete control to set and retrieve the CPU affinity of a process. However, a word of caution before we proceed: using hard affinity might cause the processors to have uneven loads.

## CPU affinity—a user’s perspective

To set or retrieve the CPU affinity of a running process from the shell prompt, you can use the *taskset* command, with which you can even launch a new task with a given affinity. Let’s see how we can do that.

Let’s suppose we have a running process, with PID (process ID) 21934. To bind this process to Processor #0 (the processor count starts from 0), let’s issue the following command:

```
$ taskset -p 0x01 21934
```

Here, the *-p* flag indicates that *taskset* operates on an existing process. The hex value *0x01* tells the new affinity mask of the process (i.e., CPU #0). Finally, the third parameter 21934 is the PID of the task.

To test the above example, you first need to find the PID of an already running process using the *ps* command. In my case, the process I picked had a PID number of 21934. Here’s the output after running the command:

```
pid 21934’s current affinity mask: 2
```

```
pid 21934’s new affinity mask: 1
```

From this output, we can conclude that for the process with PID 21934, the affinity mask is reset from 2 to 1. Now let’s explore how the current affinity mask of a running process can be seen (in my case, I picked out a running process with PID 21934):

```
$ taskset -p 21934
```

```
pid 21934’s current affinity mask: 1
```

You can also check the CPU affinity list (i.e., the list of all the processors that can run the process) of a process. This can be done with *-c* flag. Let’s have a look at it.

```
$ taskset -c -p 22139
```

pid 22139's current affinity list: 1

So far, we have seen how an affinity of an already-running process can be set/retrieved. You can also launch a new task with the given affinity. I will show you how you can do so.

```
$ taskset -c 0x01 ./a.out
```

The above command will launch a new task with Affinity Mask 1 and Affinity List 0.

## CPU affinity—a developer's perspective

Linux kernel 2.6 supports system calls that your application can exploit to enforce/retrieve the affinity at the process level. These system calls are *sched\_setaffinity* and *sched\_getaffinity*.

```
#include <sched.h>
```

```
int sched_setaffinity(pid_t pid, unsigned int cpusetsize, cpu_set_t *mask);
```

```
int sched_getaffinity(pid_t pid, unsigned int cpusetsize, cpu_set_t *mask);
```

While *sched\_setaffinity()* sets the CPU affinity, *sched\_getaffinity()* retrieves it.

The man page reads, “*sched\_setaffinity()* sets the CPU affinity mask of the process whose ID is PID to the value specified by the mask. If PID is zero, then the calling process is used. The argument *cpusetsize* is the length (in bytes) of the data pointed to by the mask. Normally, this argument would be specified as *sizeof(cpu\_set\_t)*. If the process specified by the PID is not currently running on one of the CPUs specified in the mask, then that process is migrated to one of the CPUs specified in the mask.” On the other hand, “*sched\_getaffinity()* writes the affinity mask of the process whose ID is the PID into the *cpu\_set\_t* structure pointed to by the mask. The *cpusetsize* argument specifies the size (in bytes) of the mask. If PID is zero, then the mask of the calling process is returned.”

On success, *sched\_setaffinity()* and *sched\_getaffinity()* returns 0, error returns -1.

Let's write a simple line of code to change the CPU affinity of the same program and retrieve its newly assigned affinity.

```
#ifndef _GNU_SOURCE
#define _GNU_SOURCE 1
#endif
#include <stdio.h>
#include <sched.h>

int main()
{
    cpu_set_t mymask;
    unsigned int len = sizeof(mymask);
    unsigned int pid = 0; /* Current Process */

    CPU_ZERO(&mymask);
```

```
/* The 2nd processor in the system */
CPU_SET(1, &mymask);

/* Set affinity mask of the process */
if (sched_setaffinity(pid, len, &mymask) < 0) {
    perror("main: Error in sched_setaffinity() ");
    return;
}

CPU_ZERO(&mymask);

/* Get affinity mask of the process */
sched_getaffinity(pid, len, &mymask);

printf("main: My Process Affinity is %p\n", mymask);
return 0;
}
```

The above example binds the current process to the first two processors in the system, and fetches its affinity.

## CPU affinity—leftover for developers

Finally, I would like to introduce you to the thread affinity. Initially, it did not seem like it was within the scope of this article, but while researching CPU affinity, I could not find significant discussions on the Internet or elsewhere, on affinity setting/retrieving at the thread level in Linux, apart from a synopsis of APIs in the Linux man page.

So for my own purposes, I did some experiments with thread affinity and believe that it would be worth sharing my experience with you.



**Note:** I expect readers to be familiar with multi-threading concepts (with *pthread*s) in Linux.

By default, all threads within a process inherit the same affinity that a process has. We can override this process-level affinity with APIs: *pthread\_attr\_setaffinity\_np()* and *pthread\_getattr\_np()*.

Let's explore these APIs with our next example.



**Note:** The *posix* functions with the *\_np* suffix are non-standard and not portable.

```
#ifndef _GNU_SOURCE
#define _GNU_SOURCE 1
#endif
#include <pthread.h>
#include <stdio.h>
#include <sched.h>

void * thread_aff(void *arg)
{
    cpu_set_t mymask;
    unsigned int len = sizeof(mymask);
```



```
pthread_attr_t gattr;

/* Get the attribute of this thread */
pthread_getattr_np(pthread_self(), &gattr);

CPU_ZERO(&mymask);

/* Get the affinity of the this thread */
pthread_attr_getaffinity_np( &gattr, len, &mymask);

printf("thread_aff: My Inherited Thread Affinity is %p\n", mymask);

CPU_ZERO(&mymask);
/* The 1st Processor in the system */
CPU_SET(0, &mymask);

/* Set the affinity mask for this thread */
if(0 != pthread_attr_setaffinity_np( &gattr, len, &mymask)) {
    perror("thread_aff: Error in pthread_attr_setaffinity_np() ");
}

CPU_ZERO(&mymask);
/* Get the affinity of the this thread */
pthread_attr_getaffinity_np( &gattr, len, &mymask);

printf("thread_aff: My Overridden Thread Affinity is %p\n", mymask);

pthread_exit(NULL);
}

int main()
{
    pthread_t pth;
    cpu_set_t mymask;
    unsigned int len = sizeof(mymask);
    unsigned int pid = 0; /* Current Process */

    CPU_ZERO(&mymask);
    /* The 2nd processor in the system */
    CPU_SET(1, &mymask);

    /* Set affinity mask of the process */
    if (sched_setaffinity(pid, len, &mymask) < 0) {
        perror("main: Error in sched_setaffinity() ");
        return;
    }

    CPU_ZERO(&mymask);

    /* Get affinity mask of the process */
    sched_getaffinity(pid, len, &mymask);

    printf("main: My Process Affinity is %p\n", mymask);

    pthread_create(&pth, NULL, &thread_aff, NULL);
```

```
pthread_join(pth, NULL);

CPU_ZERO(&mymask);
sched_getaffinity(pid, len, &mymask);
printf("Main: My Process Affinity is Still %p\n", mymask);

return 0;
}
```

Note that in order to compile the above code, you need to link it with *pthread* libraries using *-pthread*. To compile it, issue the following command:

```
$ gcc <Program File Name> -o <Output Executable Name> -pthread
```


The above program binds the current process to the second processor in the system, and then creates a thread: *thread\_aff*. The *thread\_aff*, by default, inherits the same affinity that the parent process currently has (i.e., binds itself with the second processor in the system). This thread then overrides this affinity and binds itself with the very first processor in the system. However, as the scope of *thread\_aff* ends, the program again verifies the process affinity to see if an alteration in the thread affinity has made any impact on the process affinity.

Ideally, you should observe that the affinity of the process remains unaffected and tied to the second processor in the system.

I, however, am slightly sceptical about the maturity of these APIs, as sometimes, I observed weird results during my experiments with them.

## What next?

Well, I've tried to introduce you to the idea of CPU affinity. Now you can play around with these system calls and experiment further. Besides the Linux man pages that are always a source of great help, Google and other search engines also help in searching for the relevant content.

Happy coding! 

## References

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# Create Cute Apps With Qt

This article covers application development with Qt SDK and database connectivity for simple applications.

If you plan to develop eye-candy applications or some nice games, or if you need to create applications to store and retrieve data at home or at office, Qt is one of the best solutions for you.

## A little background on Qt

Qt, as you perhaps already know, is a cross-platform framework used to create rich GUI applications. It's most popularly known as playing a major role in KDE applications and libraries. One of its primary advantages is that it is available for many platforms, including Linux, Macintosh and Windows. It even has its wings spread in the mobile development space with ports available for embedded Linux (Qt Extended, previously known as Qtopia), Symbian (about to release) and Windows CE.

Qt is not just restricted to GUI applications but comes with many features like multi-threading, networking, database connectivity, 2D/3D graphics with OpenGL, XML, SVG, Phonon support, WebKit integration, etc.

Although Qt programming is C++ based, you don't have to be disappointed by this fact if you are a fan of Java, Python, Ruby

or other languages. Official Java bindings are available as Qt Jambi and third-party bindings are available for many languages like Python, Ruby, etc. It can be easily integrated with popular IDEs like Eclipse and with the recent release of Qt Creator, application development is ultra simple.

Qt was started by Trolltech and was acquired by Nokia last year. Nokia later renamed it Qt Development Frameworks. Qt comes under a multi-licence model that allows both open source (under GPLv3, LGPLv2.1) and commercial usage.

## Signals and slots

Qt event handling is mainly based on a signals and slots mechanism that allows communication between different objects (widgets). When an event occurs, a signal is emitted from the source widget, triggering a slot on the target widget as per the registered mapping.

A slot is nothing but a function holding code for event handling. For example, when you click the *Exit* button, a signal is emitted, which is received by the main window and the *close* slot is executed to quit the application. Many signals and slots are predefined for all widgets, and we can always add custom signals and slots to any widget.

## Qt tools

The following are a few important tools provided by Qt SDK.

**qmake** is used to generate a platform-specific build script (Makefile) from project configuration (*.pro*) files. It is also used to create *.pro* files by inspecting available sources, headers and other files. Once the Makefile is generated, the *make* command can be used to build an application.

**Qt Designer** is used to create UI forms on the WYSIWYG principle. It allows you to create three types of forms—Window, Simple Dialogs, and Custom Widgets for re-usability. Many widgets are shown on the left-side pane of the *Designer*. You can drag and drop widgets onto the form. Apart from designing forms, it also supports property editing, signal/slot mapping, tab ordering, layout management, preview forms, etc. But *Designer* is not helpful for custom coding.

**Qt Assistant** is used to refer to documentation with great comfort.

**Qt Linguist** is used to translate user interfaces (UI) into local languages.

**Qt Creator:** As mentioned earlier, Qt Designer won't allow direct coding—you need to implement custom slots in the header, source files manually using an external editor and then use *qmake* and *make* from a terminal to build a project. This is not comfortable at all, compared to other GUI builders. However, with Qt Creator, application development can be really simple—just create a project on-the-fly and use the embedded form editor for direct coding. The context menu of any widget in the embedded editor provides an option to 'Go to Slot' to write custom slots.

## How to install

Download *qt-sdk-linux-x86-opensource-???bin* from *qt.nokia.com*. (Use *qt-sdk-linux-x86\_64-opensource-???bin* for 64-bit platforms.)

Make the bin file executable by using the following commands:

```
chmod u+x qt-sdk-linux-x86-opensource-???bin
```

Run the set-up as follows:

```
./qt-sdk-linux-x86-opensource-???bin
```

Finally, follow the step-by-step procedure to finish installation.

If you run the installation as the root user, the SDK will be installed in */opt/qt-sdk-???* by default and the Qt framework in */opt/qt-sdk-??/qt/*, which we will refer to as QTDIR from now onwards. If you install it as a normal user, your home directory is used instead of */opt*.

Run *qtdemo* located in *\$QTDIR/bin* to see Qt examples and demos, and to test them.

Check if *qt-creator* is available in the *Applications→Programs* menu after installing the SDK. Otherwise run *qt-creator* located in the */opt/qt-sdk-??/bin* directory manually.

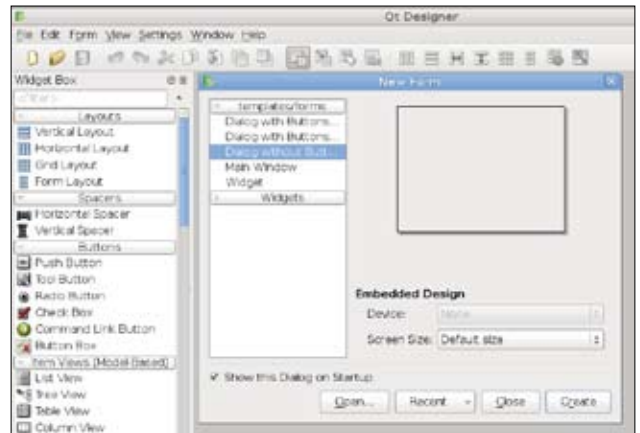


Figure 1: Qt Designer

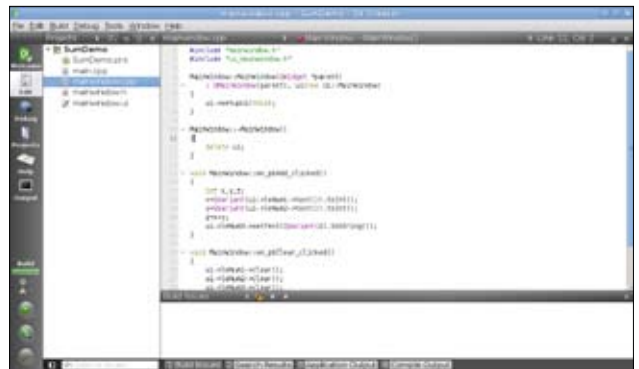


Figure 2: Qt Creator

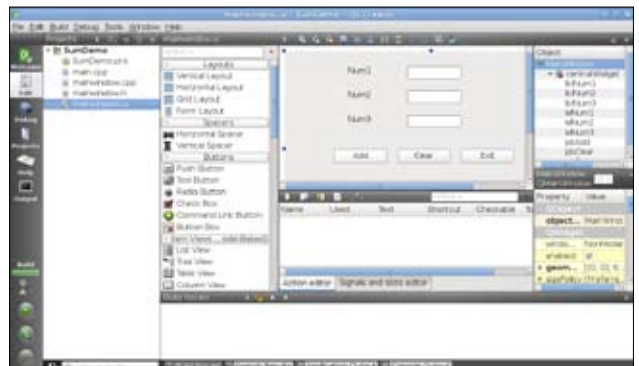


Figure 3: Editing form in the embedded editor of Qt Designer

Make sure the correct Qt framework is configured in *qt-creator* by navigating to *Tools→Options→Qt4→Qt* versions. Select the default option if more than one is available. At present, the latest stable releases are Qt Framework v4.5.2, Qt Creator v1.2.1.

## Simple applications

In this example we will create a simple application to add two numbers.

Launch Qt Creator and create a new GUI-based project by navigating to *File→New→Projects→Qt4 Gui Application*. Key in a project name, the location, and select the modules to include. For this example no additional modules other than 'default' are required.





Figure 4: Signal slot mapping

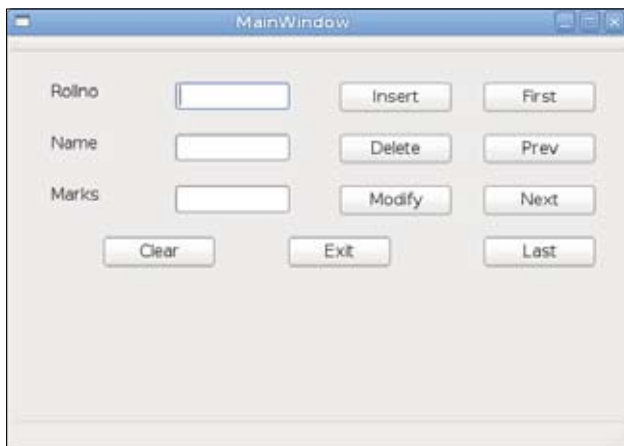


Figure 5: UI for simple database applications

From the project explorer, open *mainwindow.ui*, and place the following widgets on the form as shown in Figure 3:

- 3 Labels (object names—*lblNum1*, *lblNum2*, *lblNum3*)
- 3 Line Edits (object names—*leNum1*, *leNum2*, *leNum3*)
- 3 Push Buttons (object names—*pbAdd*, *pbClear*, *pbExit*)

To change object names of widgets, right click and select 'Change Object Name'. To change the display text of widgets, double click on them or right click and select 'Change Text'.

Enable the *readOnly* property for the third line edit with the object name *leNum3*. Use the property editor to change properties of a widget.

We now need to provide event handling for buttons. For our exit button, let's use the default signals and slot editor. Go to the signals and slot-mapping mode using the toolbar button (or F4 shortcut). Drag from the *Exit* button and drop to the empty area of the form, and a screen appears to configure the connection as shown in Figure 4. Select the check box at the bottom of the screen. Select the signal *clicked()* on the left pane and *close()* slot on the right pane. Finish the mapping by clicking the *OK* button. Come back to the widget-editing mode using the toolbar button (or F3 shortcut).

When the project is built and run, you can close the application using the *Exit* button. But for the *Add* button the action is not available by default, so we need to create a custom slot for that.

Right click on the *Add* button—>Go to Slot. (Note that this feature is available only in the embedded form editor, and not when opened with the external designer.) Select the signal *clicked()* which will create a new function (slot) *on\_pbAdd\_Clicked* in *mainwindow.cpp* and also its prototype in *mainwindow.h*. Put this code in that function's body:

```
int x,y,z;
x=QVariant(ui->leNum1->text()).toInt();
y=QVariant(ui->leNum2->text()).toInt();
z=x+y;
ui->leNum3->setText(QVariant(z).toString());
```

The *text()* function of *QLineEdit* class gives the text entered in the widget. Similarly, *setText(QString&)* is used to change the text inside. The *QVariant* class provides many constructors and functions for different types of conversion.

Similarly, you can use this code for a clear slot:

```
ui->leNum1->clear();
ui->leNum2->clear();
ui->leNum3->clear();
```

Alternatively, you can use the default signals and slot edit mode as clear slot for the line edit is predefined. Now build and run the project to test the application.

## Database applications

Before going ahead with this example, let's prepare MySQL for connectivity. Create a database called *qtest*. Create a table called 'student' with the fields *rollno(int)*, *sname(varchar)*, *marks(decimal)* as follows:

```
mysql> create database qtest;
mysql> use qtest;
mysql> create table student(rollno int, sname varchar(10),marks
decimal(8,2),primary key(rollno));
```

Create a Qt GUI Project just like the previous example, but add the *QtSql* module this time.

You can observe the statement *QT += sql* in the project file. Design the form as shown in Figure 5. You can use the external designer for convenience. *Right click on UI Form—>Open With—>Qt Designer*.

Use the following object names for the widgets

- *lblRollno*, *lblName*, *lblMarks* for labels
- *leRollno*, *leName*, *leMarks* for line edits
- *pbClear*, *pbExit*, *pbInsert*, *pbDelete*, *pbModify*, *pbFirst*, *pbPrev*, *pbNext*, *pbLast* for buttons.

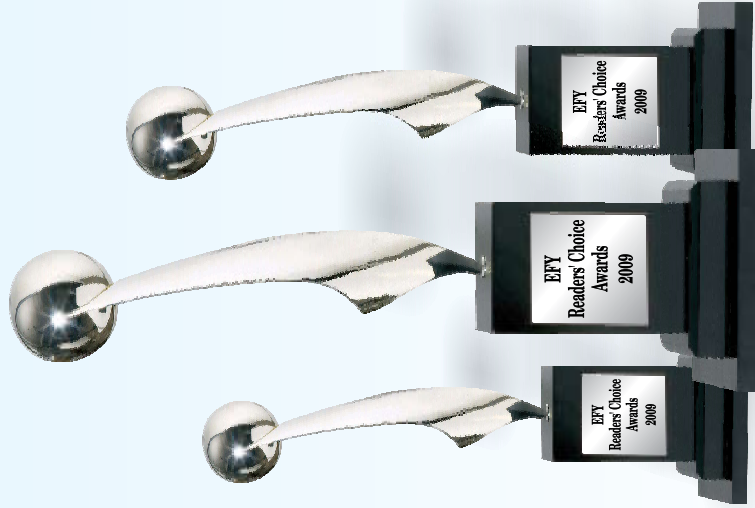
You can use default slots for the *Clear* and *Exit* options.

Close Designer, come back to Qt Creator, and add these headers to *mainwindow.h*:

```
#include <QSqlDatabase>
#include <QSqlQuery>
```



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Or instead, it's enough to add `#include<QtSql>` to use all classes in the SQL module.

Add these members in the private section of the *MainWindow* class declaration (in *mainwindow.h*):

```
QSqlDatabase db;
QSqlQuery *pquery,*pselect;
void display();
```

Add this code to the constructor of the *MainWindow* class (in *mainwindow.cpp*):

```
db = QSqlDatabase::addDatabase("QMYSQL");
db.setHostName("localhost");
db.setDatabaseName("qtest");
db.setUserName("user");
db.setPassword("password");
if(!db.open())
    qDebug("unable to connect");
pquery = new QSqlQuery();
pselect = new QSqlQuery("select * from student");
```

The *QSqlDatabase* class is helpful to establish a connection with MySQL. Various members of this class are used to specify the driver, hostname, database, user name, password, etc. After setting all these properties, use the *open* method to establish a connection—this returns true if successful.

*qDebug*, like *printf*, displays messages in the output window that you can use for logging.

Add this code to the *destructor* (in *mainwindow.cpp*):

```
delete ui;
delete pquery;
```

Code for *Insert* (right click on the *Insert* button and choose 'Go to slot'):

```
int rollno=QVariant(ui->leRollno->text()).toInt();
QString sname=ui->leName->text();
double marks=QVariant(ui->leMarks->text()).toDouble();
pquery->prepare("insert into student values(?,?,?)");
pquery->bindValue(0,rollno);
pquery->bindValue(1,sname);
pquery->bindValue(2,marks);
if(!pquery->exec())
    qDebug("Insertion failed");
else
    qDebug("inserted new row=>%d,%lf",rollno,marks);
pselect->last();
```

The *prepare* function of the *QSqlQuery* class forms a SQL query with the place holders (?), which you can bind with actual data at a later time. The *exec* function completes the operation. Or you can even pass a full-formed query to the *exec* function to perform the operation.

Code for *First*:

```
pselect->first();
display();
```

Similarly, you can write the code for the *Prev*, *Next* and *Last* buttons with the *previous()*, *next()* and *last()* slots of the *QSqlQuery* class. Use the *first*, *previous*, *next* and *last* functions to navigate between different records fetched by the query specified in the *QSqlQuery* constructor or the *exec* function (select \* from 'student' when *pselect* is created).

Code for *display* (*mainwindow.cpp*, declaration already added to *mainwindow.h*):


```
void MainWindow::display()
{
    ui->leRollno->setText(pselect->value(0).toString());
    ui->leName->setText(pselect->value(1).toString());
    ui->leMarks->setText(pselect->value(2).toString());
}
```

The *display* function holds code that's commonly required to update line edits after any navigation. The *value* method of the *QSqlQuery* class takes the field identifier as the parameter and returns its content for the current record in the *QVariant* form. The *toString* method is used to convert it into the *QString* format.

Similarly, implement the *Delete* and *Modify* operations with your own logic using the *prepare* and *exec* functions of the *QSqlQuery* class.

## Troubleshooting

The default Qt framework may not have the MySQL driver by default—you can test this by checking the contents of the *\$QTDIR/plugins/sqldrivers* directory, which should have the *libqsqlmysql.so* file. If it's missing, extract *libqsqlmysql.so* from a platform-specific package like *qt-mysql-4.x.y-z* (RPM based) or *libqt4-sql-mysql* (Deb based) and copy it to the above location manually.

If you are comfortable with compiling sources, the best way is to build Qt from the sources by adding MySQL support during configuration. **END** 

## References

- Official Qt website: [qt.nokia.com](http://qt.nokia.com)
- Documentation for Qt and related products: [doc.trolltech.com](http://doc.trolltech.com)

## By Rajesh Sola

The author is a faculty member of the Computer Science Department at NBKRIST, Vidyanagar. He is a contributor to the OpenOffice.org project and is keen on promoting FOSS awareness and adoption in rural areas. He believes in encouraging and supporting students to take the open source road. You can reach him at [rajesh@lisor dot org](mailto:rajesh@lisor dot org).



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## The Art of Guard, Part 6

# SELinux Policy Modules

In this article, we will learn about the basics of policy modules.

Last month, we looked at logging SELinux tasks and deciphering them using various methods—most notably *auditd* and *setroubleshoot* RPMs. We learned that we can easily fix minor errors involving Boolean values and/or changing the types of certain files by using commands like *setsebool* and *chcon/restorecon*.

But what about allowing a certain set of actions that are, by default, denied by the default targeted policy? What if we really want files of *tmp\_t* to be accessed by the *httpd* daemon due to certain requirements in our work environment?

What if we wanted to install our own applications and daemons while still maintaining the security provided by SELinux? What if we run an Oracle database on our RHEL server, which is exposed to the Internet—because that is its intended use?

What about the whole concept of open source, freedom and the ability to modify applications to suit our needs rather than we modifying ourselves to suit the application's needs?

Thankfully, SELinux gives us the power and complete freedom to achieve all this. There are two ways in which we can approach the whole concept of customising SELinux:

1. Modifying the source of the policy (easily available through source RPMs).
2. Developing modules that can be compiled and loaded along with the base policy.

For beginners, intermediate-level users and also for production purposes, I would not recommend the first option unless it is absolutely necessary. It requires more in-depth knowledge and experience to modify the core

policy—we will take a look at this option in a later part of this series.

For most of us, the second option of building policy modules will suffice. It is an easier approach and also lets us develop a better understanding of the SELinux policy language before we delve deeper into it by modifying the core policy.

### Customising the default policy: Power to the people

As discussed above, we will customise the default targeted policy by adding our own modules. To do so we will use the *semodule* command.

*semodule* is the tool used to manage SELinux policy modules, including installing, upgrading, listing and removing modules. It is installed by the *policycoreutils* RPM. The man page, as usual, gives further details and helpful instructions on how to use the command.

### Listing SELinux modules

To list modules, use the following:

```
# semodule -l
```

If you execute this command on a freshly installed system with SELinux enabled, you will see a list of modules. A sample output on my system follows:

```
[root@vbg ~]# semodule -l
amavis 1.1.0
ccs 1.0.0
clamav 1.1.0
```



```

dcc 1.1.0
evolution 1.1.0
iscsid 1.0.0
mozilla 1.1.0
mplayer 1.1.0
nagios 1.1.0
oddjob 1.0.1
openoff 1.0.0
pcscd 1.0.0
pyzor 1.1.0
razor 1.1.0
ricci 1.0.0
smartmon 1.1.0
tmp 1.0.1
vbg 1.0.3

```

What this means is that the default SELinux installation does come with some modules loaded that are not part of the base policy. Looking more closely into the output of the above command, we see that in my system there are 18 policy modules installed. Each row of the above output corresponds to a policy module.

The output of the `semodule -l` command gives us two columns of information: *Module Name* and *Module Version*. Thus we can see that the *amavis* module has a version number of 1.1.0 whereas the *vbg* module has a version 1.0.3.

Also, these are the modules currently loaded into the memory and are active along with the base policy. But, where are these modules located? What difference do they make to the overall SELinux policy? How are they loaded and removed?

Let's try to answer the above questions, one by one.

These are binary policy modules that, by default, have a file extension of *.pp* (Policy Package). Generally, the module name and the file name is kept the same, though it's not mandatory. Therefore, we need to look up a file named *amavis.pp* (Policy Package for the Amavis daemon). By default, the location of this file is `/etc/selinux/targeted/modules/active/modules/`. If you go into this folder and list the contents, you will see the policy package files of all the currently loaded modules.

The policy modules obviously make a lot of difference. That's what they were created for. To observe the difference they make, let's use the wonderful *seinfo* tool discussed earlier.

To get an overall idea of the SELinux policy currently loaded, we shall use the command *seinfo*. A sample output from my system is shown below:

```
[root@vbg modules]# seinfo
```

```
Statistics for policy file: /etc/selinux/targeted/
policy/policy.21
```

```
Policy Version & Type: v.21 (binary, MLS)
```

```

Classes:      61  Permissions:  220
Types:       1516 Attributes:  148
Users:        3   Roles:      6
Booleans:    211 Cond. Expr.: 187
Sensitivities: 1 Categories: 1024
Allow:       82576 Neverallow: 0
Auditallow:  28 Dontaudit:  5086
Role allow:   5 Role trans:   0
Type_trans:  1400 Type_change: 17
Type_member:  0 Range_trans:  23
Constraints:  47 Validateatrans: 0
Fs_use:       15 Genfscon:    64
Portcon:      264 Netifcon:    0
Nodecon:      8 Initial SIDs:  27

```

We can see that there are 1,516 types and 82,576 allow rules being recognised by SELinux. You can redirect this output to a temporary file just for comparison, later. You could use the following command:

```
[root@vbg modules]# seinfo > /tmp/org-selinux-
policy
```

Let's now remove one of the loaded modules. As an example, let us remove the *amavis* module.

## Removing SELinux modules

To remove a loaded SELinux module, use the *semodule* command with the *r* option and the module name as the argument. For example:

```
[root@vbg modules]# semodule -r amavis
```

This removes the *amavis* module. To ensure that the above command

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## The November Training Calendar

- **Fast Track RHCE:**  
4<sup>th</sup> Nov 09 & 11<sup>th</sup> Nov 09
- **Regular RHCE:**  
9<sup>th</sup> Nov 09 (7am – 9am)  
9<sup>th</sup> Nov 09 (6pm – 9pm)
- **RH 423 LDAP:**  
5<sup>th</sup> to 8<sup>th</sup> Nov 09
- **RH 429 SELinux**  
11<sup>th</sup> to 14<sup>th</sup> Nov 09
- **Clustering & Storage**  
20<sup>th</sup> to 22<sup>nd</sup> Nov 09
- **PostgreSQL**  
20<sup>th</sup> to 22<sup>nd</sup> Nov 09
- **PHP & MySQL**  
18<sup>th</sup> Nov 09
- **Shell Scripting**  
30<sup>th</sup> Nov 09
- **Mail Server**  
9<sup>th</sup> - 11<sup>th</sup> Nov 09
- **Jboss**  
14<sup>th</sup> Nov 09 (Sat & Sun)

Exam Dates

- **RHCE:**  
9<sup>th</sup> & 25<sup>th</sup> Nov 09
- **EX 423:**  
16<sup>th</sup> Nov 09
- **EX 429:**  
16<sup>th</sup> Nov 09
- **EX 333:**  
17<sup>th</sup> Nov 09

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has worked, list all the currently loaded modules:

```
[root@vbg modules]# semodule -l
ccs      1.0.0
clamav   1.1.0
dcc      1.1.0
evolution 1.1.0
iscsid   1.0.0
mozilla  1.1.0
mplayer  1.1.0
nagios   1.1.0
odddjob  1.0.1
openoff  1.0.0
pcscd    1.0.0
pyzor    1.1.0
razor    1.1.0
ricci    1.0.0
smartmon 1.1.0
tmp      1.0.1
vbg      1.0.3
```

To understand the difference made by the removal of the 'amavis' package, again redirect the output of *seinfo* to a file:

```
[root@vbg modules]# seinfo > /tmp/new-selinux-policy
```

...and run a *diff* on the two files:

```
[root@vbg modules]# diff /tmp/org-selinux-policy /tmp/new-selinux-policy
6c6
< Types:      1516  Attributes:  148
---
> Types:      1507  Attributes:  148
8c8
< Booleans:   211   Cond. Expr.: 187
---
> Booleans:   210   Cond. Expr.: 186
10,11c10,11
< Allow:      82576 Neverallow:   0
< Auditallow:  28   Dontaudit:  5086
---
> Allow:      81929 Neverallow:   0
> Auditallow:  28   Dontaudit:  5062
13c13
< Type_trans: 1400  Type_change:  17
---
> Type_trans: 1387  Type_change:  17
```

You will see that removing *amavis* has made the following changes:

1. Reducing the number of 'types'

from 1,516 to 1,507

2. Reducing the number of 'Booleans' from 211 to 210
3. Reducing the number of 'allow rules' from 82,576 to 81,929
4. Reducing the number of 'type transition rules' from 1400 to 1,387 and so on...

Thus, we see that by using modules, we can at least add types, Booleans and rules to the core policy. That is pretty much what we want to do when we need to modify the default policy to suit our needs.

From what we've just covered, it is clear that we need to create SELinux policy modules—thereby creating new types, Booleans and various rules.

## Creating SELinux modules

SELinux policy modules need to be written in the SELinux policy language. It is not a complicated language at all, but like most programming languages, requires a certain structure and syntax to be followed while creating the modules.

Also, once the text files containing our desired modifications have been created, we need to compile them into a binary policy module (Policy Package). Once the Policy Package files have been created, they just need to be tested and then finally loaded to enable the desired functionality.

To enable the development and compilation of policy modules, install the *selinux-policy-devel* RPM. The installed RPM on my system is *selinux-policy-devel-2.4.6-106.el5\_1.3*.

This module creates the */usr/share/selinux/devel/* directory, which contains 'include' files and a makefile for compilation. It also installs three files—*example.te*, *example.fc* and *example.if*—to assist you in the creation of policy modules.

The three files are important to understand the structure of policy modules:

- The type enforcement file (a file with the *.te* extension—for example, */usr/share/selinux/devel/example.te*) is the most important file. This contains the

name of the module, its version and all the additions desired in the policy, such as types, rules, Booleans, etc.

- The file contexts file (with the *.fc* extension—for example, */usr/share/selinux/devel/example.fc*) contains the default security contexts to be provided for files created/used by the application for which we are creating the policy module.
- The interface file (one with the *.if* extension—for example, */usr/share/selinux/devel/example.if*) generally would contain macro definitions that assist in creating type enforcement rules.

The type enforcement file (*.te*) is mandatory, while the other two files (*.fc* and *.if*), if not required, need not be explicitly created. I would advise their use, but it generally depends on the kind of policy module to be developed.

## Syntax of the type enforcement file

The most important thing for a policy module to be clearly distinguished is its name and version—the output of the *semodule -l* command. This is specified as the first line in a *.te* file as *policy\_module(<policy name>, <policy version>)*.

New types being introduced by the module are declared as *type <new type>;*.

Let's create a small policy module called *test* to introduce a new type called *lfi\_t*. Use the following steps to achieve the above:

1. Create a work directory for building and compiling your SELinux modules.
2. Copy the necessary files needed for compiling SELinux modules.
3. Create at least a *.te* file for your SELinux module, specifying the module name and version number.
4. Compile the source file above to a binary policy package file.
5. Load the binary policy package.
6. Test the changes in the SELinux Policy.



### Step 1: Create a work directory for building and compiling your SELinux modules.

Instead of working in default directories, experience has taught me to work as a non-root user in non-default folders. Let us log in as the non-root user and make a working directory for our SELinux modules:

```
[vbg@vbg ~]$ mkdir test-selinux
[vbg@vbg ~]$ cd test-selinux/
```

### Step 2: Copy the necessary files needed for compiling SELinux modules.

The only important file that you need to copy to your working directory is the Makefile from the `/usr/share/selinux/devel/` directory.

```
[vbg@vbg test-selinux]$ cp /usr/share/selinux/devel/Makefile .
[vbg@vbg test-selinux]$ ls
```

### Step 3: Create at least a .te file for your SELinux module, specifying the module name and version number:

```
[vbg@vbg test-selinux]$ vim test.te
```

Put the following text in the above file:

```
policy_module(test,1.0)

type lfy_t;

~

:wq
```

And save the source file.

The above step specifies that we are creating a policy module named `test` with the version 1.0 and are declaring a new type to be introduced in the policy called `lfy_t`.

### Step 4: Compile the source file above to a binary policy package file

To compile the source, simply run `make` (ensure you have copied the Makefile in Step 2 shown above):

```
[vbg@vbg test-selinux]$ make
Compiling targeted test module
/usr/bin/checkmodule: loading policy
```

```
configuration from tmp/test.tmp
/usr/bin/checkmodule: policy configuration
loaded
/usr/bin/checkmodule: writing binary
representation (version 6) to tmp/test.mod
Creating targeted test.pp policy package
rm tmp/test.mod.fc tmp/test.mod
```

You should now have the compiled policy package file `test.pp`:

```
[vbg@vbg test-selinux]$ ll
total 60
-rw-r--r-- 1 vbg vbg  437 Sep 24 10:36 Makefile
-rw-rw-r-- 1 vbg vbg   0 Sep 24 10:36 test.fc
-rw-rw-r-- 1 vbg vbg   0 Sep 24 10:36 test.if
-rw-rw-r-- 1 vbg vbg 22994 Sep 24 10:36 test.pp
-rw-rw-r-- 1 vbg vbg   37 Sep 24 10:36 test.te
drwxrwxr-x 2 vbg vbg 4096 Sep 24 10:36 tmp
```

To check if a type `lfy_t` exists, just use the following command:

```
[root@vbg devel]# seinfo -t | grep lfy
```

You will not receive any output. This shows that the type `lfy_t` does not exist in our policy currently.

### Step 5: Load the binary policy package.

As the root user, use the `semodule` command to load the compiled `test.pp` policy package. The option to use with the `semodule` command is `-i` (which stands for insert).

```
[root@vbg devel]# semodule -i /home/vbg/test-selinux/test.pp
```

To confirm if the module has been successfully loaded, list all the modules:

```
[root@vbg devel]# semodule -l
ccs      1.0.0
clamav   1.1.0
dcc      1.1.0
evolution 1.1.0
```

```
iscsid   1.0.0
mozilla  1.1.0
mplayer  1.1.0
nagios    1.1.0
oddjob    1.0.1
openoff   1.0.0
pcscd     1.0.0
pyzor     1.1.0
razor     1.1.0
ricci     1.0.0
smartmon  1.1.0
test      1.0
tmp       1.0.1
vbg       1.0.3
```

You can see that a module named `test` with version 1.0 has been loaded. To check whether our new type has been added, retype the earlier command:

```
[root@vbg devel]# seinfo -t | grep lfy
lfy_t
```

This shows that we have successfully introduced a new type in our SELinux policy by adding a policy module.

## Up next

In this article, we have covered the basics of policy modules. In the next part of the series, we will look at adding allow rules, type transition rules, Booleans and other policy building blocks. We shall also look at the `audit2allow` tool that helps to create policy modules.

I hope the article has helped you understand the modular structure of SELinux. It is this modularity that allows administrators to easily create SELinux policy modules for whatever applications they deploy -- without compromising the security of their system.

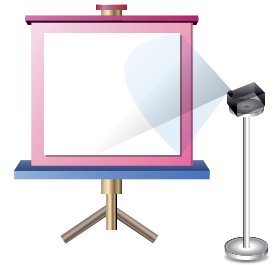
Looking forward to meeting you all again, next month...  **END**

### By: Varad Gupta

Varad is an open source enthusiast who strongly believes in the open source collaborative model not only for technology but also for business. India's first RHCSS (Red Hat Certified Security Specialist), he has been involved in spreading open source through Keen & Able Computers Pvt Ltd, an open source systems integration company, and FOSTERING Linux, a FOSS training, education and research training centre. The author can be contacted at [varad.gupta@fosteringlinux.com](mailto:varad.gupta@fosteringlinux.com)

# ‘Typesetting’ Presentations with Beamer

Do you use LaTeX for your document processing requirements? Then why switch to any other application when you need to create presentations? Try Beamer instead.



Beamer ([latex-beamer.sourceforge.net](http://latex-beamer.sourceforge.net)) is a LaTeX class for making presentation slides. In LaTeX parlance, it's just another Document Class.

Why would you want to hack LaTeX to create slides? Hasn't OpenOffice.org, or worse, a certain Microsoft PowerPoint, already won that battle?

You shouldn't even attempt to use Beamer if you have no idea what LaTeX is. However, if you already use LaTeX—chances are you swear by it—then Beamer is for you. With Beamer, you can create slides for *that* upcoming talk without compromising on eye candy, and with the comfort levels of your favourite document preparation system.

As an aside, explore and learn LaTeX. If you are a student, you will create better-looking project reports; and if you are a writer, you will create more professional looking articles, manuals and books. The *Resources* section at the end will have some links to learn more about LaTeX. To make the best use of the rest of this article, I shall assume an intermediate knowledge of LaTeX.

## Installation

The easiest way to install LaTeX Beamer is to use the package manager on your Linux distribution. On Debian and Ubuntu, the package is named as *latex-beamer*. Do an *apt-get* install:

```
# apt-get install latex-beamer
```

You will see that some more packages that provide extra LaTeX classes need to be installed. Prominent among these are *latex-xcolor* and *pgf*. Hit a *y* for the installation of the packages to start. You should have the Beamer LaTeX installation in */usr/share/texmf/tex/latex/beamer/*. (Note that if you do not have LaTeX installed, it might ask you to install more packages.)

There is, of course, the option of installing LaTeX class manually. It's easy to do, but not easier than the previous method. The LaTeX Beamer user guide shows you how to do it.

Now that we are done with the installation, let us create our first presentation with LaTeX Beamer. In the rest of this article, I shall assume that we have used the package manager to install the Beamer LaTeX class. If you have installed it manually, it will just need a little bit of correlation between the article details and the source code.

## Simple presentations

Before we create our own presentation, let us compile one of the shipped examples. Copy the *beamerexample-conference-talk.tex* files from */usr/share/doc/latex-beamer/examples/a-conference-talk* to a sub-directory under your home, say *~/beamer/examples*. Now, compile the *.tex* file using *latex*:

```
$ latex beamerexample-conference-talk.tex .
./beamerexample-conference-talk.toc [2] [3] [4] [5] [6] [7] [8] [9] [10]
[11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25]
[26] [27] [28] [29] [30] [31] (./beamerexample-conference-talk.aux)
Output written on beamerexample-conference-talk.dvi (31 pages, 763500
bytes).
Transcript written on beamerexample-conference-talk.log.
```

If you see some errors reported, a fix is needed somewhere. We should have the presentation ready in the *.dvi* file. Now, use the *dvipdf* utility to convert it into a PDF file and open it using a PDF reader, such as Evince. Figure 1 is a screenshot of the first slide.

Impressed? I am. Let's continue getting impressed.

Diving in, open the *.tex* file in a LaTeX editor of your choice. VIM-LaTeX ([vim-latex.sourceforge.net](http://vim-latex.sourceforge.net)) brings

you the best of both worlds. The first line after the comments is `\documentclass{beamer}`. So Beamer is just another LaTeX document class. Good, just the thing I promised.

The theme for your presentation is specified using `\usetheme{Darmstadt}`. You can view all the current themes installed in `/usr/share/texmf/tex/latex/beamer/themes/theme`. Then you specify other appearance-specific settings such as the template, font, etc. After specifying the author and the title, the main document or the presentation starts from `\begin{document}`, and a new slide is enclosed by `\begin{frame}` and `\end{frame}`. Let us now create a new presentation and learn more while we put to use what we have already learnt.

## Creating a new presentation

We will create a slide deck consisting of a *Title* slide, a *Table of Contents* and two other slides—*Introduction* and *Summary*. Listing 1 gives the complete code for the `.tex` file, which we will call *example.tex*:

```
% A simple presentation in LaTeX using Beamer
% Can be used as a template for larger, specific
% presentations
% example.tex

\documentclass{beamer}

\mode<presentation>
{
    \usetheme{Berkeley}
    \setbeamercovered{transparent}
}

\usepackage[english]{babel}
\usepackage[latin1]{inputenc}

\usepackage{times}
\usepackage[T1]{fontenc}

\title{Beam it with Beamer}

\subtitle{Presentations in LaTeX}

\author{Amit Saha}
```

```
\date{October 1, 2009/ LFY}

\begin{document}

\begin{frame}
\titlepage
\end{frame}

\begin{frame}{Outline}
\tableofcontents
\end{frame}

\section{Introduction}

\begin{frame}{What is Beamer?}{Beam it up!}
\begin{itemize}
\item A LaTeX class for creating high quality
presentations.
\end{itemize}
\end{frame}

\section{Summary}

\begin{frame}{Did we like Beamer?}

\begin{itemize}
\item Yes!
\end{itemize}
\end{frame}

\end{document}
```

Some of the LaTeX elements are generic to any LaTeX document, such as `\title`, `\author` and `\usepackage`. Here are some Beamer-specific elements:

- **New Slide:** A slide is enclosed by `\begin{frame}` and `\end{frame}`.
- **New Section:** The section name before a `\begin{frame}` is the entry for the new slide in the *Table of Contents*, generated by `\tableofcontents`.

You can now compile the LaTeX file similarly. With what we have learnt so far, we can easily create presentations that would contain only text.

## More things to try out


- **Working with graphics:** Working with images here is the same as you would do for any LaTeX document class by making use of the *graphics* or *graphicsx* package.



Figure 1: An example presentation created using Beamer

- **Using multimedia in your slides:** Beamer ships with the *multimedia* package that you can use to insert sound, animation or movies. I haven't tried this feature. So you will have to use it to see how well it works!
- **Notes and handouts:** Besides creating the presentation, you might also want to create notes for yourself or to distribute as handouts. Beamer class also has support for creating these.

## Still hooked?

If you have been following this article and at the same time typing in some of the LaTeX class, I am hoping that Beamer has impressed you, or at the very least, you'll now consider it as an option. The Beamer user guide has a lot more detailed information on the topics I have touched and more, and is a very handy reference while you create your presentation. For queries, doubts and suggestions, please feel free to e-mail me.  **END**

### Resources

- Beamer: [latex-beamer.sourceforge.net](http://latex-beamer.sourceforge.net)
- Beamer Documentation: In `/usr/share/doc/latex-beamer` or in your source tarball
- LaTeX resources: [en.wikipedia.org/wiki/LaTeX#Further\\_reading](http://en.wikipedia.org/wiki/LaTeX#Further_reading)

### By: Amit Saha

The author blogs at [amitsaha.wordpress.com](http://amitsaha.wordpress.com) and can be reached at [amitsaha.in@gmail.com](mailto:amitsaha.in@gmail.com).





# Tips & Tricks



## Kill your processes graphically

The *xkill* command closes the connections of a client to X server. Using the *xkill* command changes your mouse cursor into a 'kill' sign. Now when you click the left mouse button on any window that you want to kill, it gets killed. Note that this program is very dangerous, yet useful for aborting program windows that otherwise do not shut down.

—Arunprasad R, [arunprasad@gmail.com](mailto:arunprasad@gmail.com)



## Play songs from the command line

You can play any song file from the command line without using any player but a utility called SOX. More often than not, SOX is available in your distro's repository. You can install it in a Debian-based system as follows:

```
apt-get install sox
```

To play a song from the command line, use:

```
play song.mp3
```

...where song.mp3 is the path to your MP3 file. To stop playback, hit *Ctrl+C*.

If your song's file name contains spaces, specify the file name within double quotes. For example:

```
play "song 2.mp3"
```

When playing audio files, you can even specify more than one input file as follows:

```
play "song 2.mp3" "song 3.mp3" "song 5.mp3"
```

—Pramod, [pramod@icsplindia.com](mailto:pramod@icsplindia.com)



## Check processes not run by you

Imagine the following scenario: you get yourself ready for a quick round of *Crack Attack* against a colleague at work, only to find the game drags to a halt just as you're about to beat your uppity subordinate. What could have happened to make your machine so slow? It must be some of those other users, stealing your precious CPU time with their scientific experiments, Web servers or other weird, geeky applications!

Okay, so let's list all the processes not being run by you. Just run the following command:

```
ps aux | grep -v `whoami`
```

Or, to be a little cleverer, why not just list the top ten time-wasters...

```
ps aux --sort=-%cpu | grep -m 11 -v `whoami`
```

It is probably best to run this as the root user, as this will filter out most of the vital background processes. Now that you have the information, you can simply kill their processes, but much more dastardly would be run *xeyes* on their desktop. Repeatedly!

—Pavan Kumar Nelanuthula,  
[pavan.n@gmail.com](mailto:pavan.n@gmail.com)



## Driver information of Ethernet

You can use the following command to get information about the driver and firmware version of your Ethernet card as follows:

```
# ethtool -i eth0
```

A typical output for the command follows:

driver: vmxnet

version: 2.0.1.1

firmware-version: N/A

bus-info: 0000:00:11.0

/dev/ttyS1, UART: unknown, Port: 0x02f8, IRQ: 3

/dev/ttyS2, UART: unknown, Port: 0x03e8, IRQ: 4

/dev/ttyS3, UART: unknown, Port: 0x02e8, IRQ: 3

ttyS0 - first serial port

port :0X03f8 - i/o address

IRQ-4 - interrupt number of serial port

—Parvez Ansari, iamnetizen@gmail.com



## Defrag your databases

Whenever you change the structure of a MySQL database, or remove a lot of data from it, the files can become fragmented resulting in a loss of performance, particularly when running queries. Just remember to run the optimiser every time you make any changes to the database:

```
mysqlcheck -o <dbname>
```

—Remin Raphael, remin13@gmail.com



## Restoring defaults in KDE4

Sometimes while personalising your panel you may accidentally delete it. And then you may want to restore the distro's default panel back again. This is how we do it on KDE 4.

Log out and open a command prompt using Ctrl+Alt+F1. Then log in as the same user and run this command:

```
rm .kde4/share/config/plasma-appletsrc
```

This is the file where configurations are stored for any user. If you remove it, the default settings will reappear. Use Ctrl+Alt+F7 in order to access the X server to log back in.

—Roshan Kumar Singh,  
singh.roshan08@gmail.com



## I/O address, IRQ number of serial ports

Those of you who are writing device drivers for serial ports should know the I/O address of each serial port and its IRQ number. To find out, type the following command:

```
setserial -g /dev/ttyS*
```

You should get something similar to what's shown below:

```
/dev/ttyS0, UART: 16550A, Port: 0x03f8, IRQ: 4
```



## What have you done?

The *history* command will give you the complete history of all the commands you've run till now along with their serial numbers. For example:

```
$ history
```

```
1 su -
2 kmail
3 rm -rf .kde4/share/apps/kmail/mail
4 rm -rf .mozilla/
5 rpm -qa | grep flash
6 top
7 rpm -qa | grep rpm
8 ps -A | grep rpm
9 cd /var/lib/flash-player-plugin/
10 su -
```

There is a history manipulation command too called *fc*. Type:

```
fc 9
```

This will allow you to edit the command using the Vim editor. When you save and exit, it runs the command automatically.

—Ashraf Ali, ashrafd2005@gmail.com



### Share Your Linux Recipes!

The joy of using Linux is in finding ways to get around problems—take them head on, defeat them! We invite you to share your tips and tricks with us for publication in LFY so that they can reach a wider audience. Your tips could be related to administration, programming, troubleshooting or general tweaking. Submit them at [www.linuxforu.com](http://www.linuxforu.com). The sender of each published tip will get an LFY T-shirt.



Sandya Mannarswamy

Welcome to another instalment of CodeSport. This is a special Diwali Edition in which we feature 20 interesting programming questions often asked in interviews.

As you know, every month we discuss one specific topic in programming and feature a couple of coding questions related to it. However, we will take a break this month since many readers have asked me for programming questions that they might find useful to practice and warm up for prior to an interview. So here are 20 interesting programming questions covering various topics in algorithms and data structures. I will leave these questions open for our readers to answer, and we will feature their solutions in next month's column. Let's get started with the easier ones.

- (1) Can you have both const and volatile qualifiers applied to a single declaration in C? If so, can you give an example? If not, why not?
- (2) Consider the following code snippet:

```
main()
{
    int a, b;
    a = foo();
    b = foo();
    printf("a = %d b = %d\n", a, b);
}
```

You do not know anything about function 'foo' except that it returns an integer.

Are the values of *a* and *b* printed by the *printf* function the same? If not, can you give an example of function 'foo' which will cause *a* and *b* to be different?

- (3) Given a word, can you find all its anagrams? If you were asked to do this for only one word, what would be your solution? If you were asked to find the anagrams for 10,000 words, would your solution change?
- (4) What is the time complexity of searching for an element in a...
  - a) Linked list containing *N* elements
  - b) Hash table containing *N* elements
  - c) Binary search tree containing *N* elements
  - d) A binary heap containing *N* elements
  - e) A d-heap containing *N* elements
- (5) Consider the following code snippet:

```
int find_fib (int N)
```

```
{
    assert (N > 0);
    int f1 = 1;
    int f2 = 1;

    if (N < 2)
        return 1;

    return (find_fib(N-1) + find_fib(N-2));
}
```

Given that *find\_fib* is called from *main* with *N* as 25, how many total calls are made to *find\_fib*?

## Sorting/searching/string manipulation problems

- (6) You are given an array of  $2n+1$  integers. You are told that except for one element, all other elements have a duplicate in the array. Can you find the one element that has no duplicate in the array? What is the time complexity of your solution?
- (7) You are given an array *A* of *N* integers. A majority element *M* is an element that appears more than  $N/2$  times in the array. For instance, given the array of integers, 10, 6, 10, 3, 10, 10 is the majority element. Given the array 10, 6, 10, 3, 10, 21, 5, there is no majority element. For the given array of *N* integers, write an algorithm to find whether a majority element exists and if so, what is it? The algorithm should have a worst-case complexity of  $O(N)$ .
- (8) You are given two strings, *S1* and *S2*. The maximum length of either of the strings is *N* characters. You need to create a new string containing only those characters that appear in both the strings. Remember that the trivial solution is  $O(N^2)$  wherein we compare each character of the first string to every character in the second string. Can you come up with a better solution?
- (9) You are given a sorted sequence of distinct integers,  $a_1, a_2, a_3 \dots a_N$ . Give an algorithm to determine whether there exists an index *i* such that the element at the  $i^{\text{th}}$  position is equal in

value to  $i$ . For example, in the sequence, -3, 4, 3, 34, 10, we have  $a_3=3$ , which satisfies the criterion; whereas in the sequence -3, 40, 2, 12, 6, there is no such index  $i$ . What is the complexity of your algorithm?

- (10) Let's suppose you are given an array  $A$  of  $N$  sorted numbers that has been circularly shifted  $k$  positions to the right. For example, (34, 40, 2, 12, 28) is a sorted array that has been circularly shifted  $k=2$  positions, while (34, 40, 45, 61, 2, 12, 28) has been shifted  $k=4$  positions. Suppose you know what  $k$  is, give an  $O(1)$  algorithm to find the largest number in  $A$ . If you do not know the value of  $k$ , can you give an algorithm with a complexity of  $O(N)$  for finding the largest number in  $A$ ? Can you improve your solution to an algorithm of complexity  $O(\log N)$ ?
- (11) Design a data structure that allows you to search, insert and delete an integer  $X$  in  $O(1)$  time in a table (i.e., constant time, independent of the total number of integers stored). Assume that  $1 \leq X \leq N$ . Also assume that the maximum number of integers in the table can only be  $M$  at any one time. You are given  $M+N$  units of space available for the table. Though at first you may want to use a flags array of  $M$  flags, note that you cannot initialise the flags array since that would take a time of  $O(M)$  and hence is not permitted. So you need to work with a flags array that can contain uninitialised data.
- (12) You are given an array of  $N$  integers. Some of the integers are positive and others negative. You have to partition the array such that all the negative elements occur first and then all the positive elements. (There is no need to sort the elements within the sub-partition of all negative and all positive elements.) What is the time complexity of your solution?
- (13) Among all the spanning trees of a weighted and connected graph, the one (possibly more) with the least total weight is called a minimum spanning tree (MST). There are well-known algorithms for determining the MST of a given weighted connected graph  $G$  such as Prim's and Kruskal's algorithm. Our question is as follows: Given a minimum spanning tree, is the path between a pair of vertices in a minimum spanning tree necessarily the shortest path between the two vertices in the full graph  $G$ ? Give a proof or a counter example.

## Graphs and trees

- (14) All of you are familiar with tree traversals. Pre-order, in-order, and post-order traversals are the three types of tree traversals. If the root node is visited before either of its sub trees, this is a pre-order. If the root node is visited after visiting the left sub tree and right sub tree, then it is a post-order traversal. If the left sub tree is visited first, then the root node, followed by the right sub tree, then it is an in-order traversal. Given only the pre-order and in-order traversals of a tree, is it possible to construct a unique binary tree from it?
- (15) Given an undirected graph  $G(V, E)$ , where  $V$  is the set of vertices and  $E$  is the set of edges, and given that all

vertices have an even degree, can you give an algorithm to determine whether there exists a subset  $S$  of  $k$  vertices in a graph  $G$ , such that every edge in  $G$  is incident upon at least one vertex in  $S$ ?

## A few more challenging questions


- (16) Given three arrays  $A$ ,  $B$  and  $C$  of integers containing positive and negative numbers, we have to determine if there are three elements  $a \in A$ ,  $b \in B$  and  $c \in C$  such that their sum  $a+b+c$  is equal to zero.
- (17) Given an input array of distinct 100,000 integers to be sorted, you are told that you have memory available only for 1,000 numbers at a time. You have no constraints in terms of disk storage. Can you come up with an algorithm to sort the 100,000 numbers? If you are told that the range of values of the input array is also 1 to 100,000, how would your solution change? What would be your solution if the input array contained duplicates?
- (18) Given the following code snippet:

```
bool foo (int n)
{
    for (i=3; i < sqrt(n)+0.5; i+=2)
    {
        if (n % i == 0)
        {
            return false;
        }
    }
    return true;
}
```

can you figure out what is the purpose of the function *foo*?

- (19) Given a 32-bit integer  $N$ , come up with an algorithm to find the number of zeroes in the binary bit representation of  $N$ . What is the time complexity of your algorithm?
- (20) Let  $S$  be a sorted array of  $n$  integers. Give an algorithm that finds the pair of elements  $x, y \in S$  that maximises  $|x-y|$ . What is the time complexity of your solution?

Readers are requested to send their solutions to these questions, which I will discuss in next month's column. Also, if you are preparing for an interview in the computer science programming field, you may find it useful to visit my programming interviews discussion group 'Computer Science Interview Training (India)' on LinkedIn ([www.linkedin.com](http://www.linkedin.com)).

If you have any favourite programming puzzles that you would like to discuss on this forum, please send them to me, along with general feedback at [sandyasm\\_AT\\_yahoo\\_DOT\\_com](mailto:sandyasm_AT_yahoo_DOT_com). Till we meet again next month, happy programming. 

### About the author:

**Sandya Mannarswamy.** The author is a specialist in compiler optimisation and works at Hewlett-Packard India. She has a number of publications and patents to her credit, and her areas of interest include virtualisation technologies and software development tools.





# Python in Research, Part 3

## Modelling Epidemics

Most of us have been affected by the fear of H1N1 (swine flu). As with any epidemic, public health organisations need to model this pandemic too, in order to be prepared with preventive or precautionary actions. In this article, you will look at how Scipy can be used to model an epidemic using the simple SIR model.

The basic idea is that the population consists of three groups—the susceptible, the infected and those who have recovered. It is reasonable to assume that the rate at which susceptible people are infected will be proportional to the possible pairs of susceptible and infected populations, i.e., their product. It is also reasonable to assume that the rate at which people recover will be proportional to the infected population. Finally, the rate of change in the infected group will be the difference between the infection rate and the recovery rate. The SIR model can, thus, be represented as a set of simple ordinary differential equations (assuming that there are no births or deaths):

- $ds/dt = -bs(t)i(t)$  # rate of change amongst the susceptible
- $di/dt = bs(t)i(t) - ki(t)$  # rate of change amongst the infected
- $dr/dt = ki(t)$  # rate of change of those who've recovered

If the factors  $b$  and  $k$  are known, and the initial values of the susceptible, infected and recovered populations are also known, the above equations can be integrated and a solution found.

### An elementary example

Suppose 10 people in a city of a million are infected. The infectious period of a flu typically lasts for five days; so, an estimated 20 per cent of the infected cases recover each day.

Usually, the values of  $s$ ,  $i$  and  $r$  are

normalised so that the sum of the three is 1. In this case, the ratio of  $b:k$  is indicative of the number of people infected by an infected person. Assuming that each infected person infects another two, what will happen in the next 100 days?

Here's how you can find out by substituting the values in the following equation:

$$b = 2 * k = 0.4$$

$$k = 0.2$$

The Scipy package includes an *integrate* module, which can be used to compute the susceptible, infected and recovered populations for each succeeding day, for as many days as needed.

```
import scipy as np
from scipy import integrate
def dif_eq(V,t,b,k):
    """
    Compute the derivatives for the differential
    equations
    V = current values of [Susceptible, Infected,
    Recovered]
    """
    dVdt = np.zeros(3)
    dVdt[0] = -b*V[0]*V[1]
    dVdt[1] = b*V[0]*V[1] - k*V[1]
    dVdt[2] = k*V[1]
    return dVdt
P = 1e6 # a million
I0 = 10/P # 10 people are infected
S0 = 1 - I0 # Susceptible population
R0 = 0 # Initial Recovered
k = 0.2 # Infection lasts 5 days
```

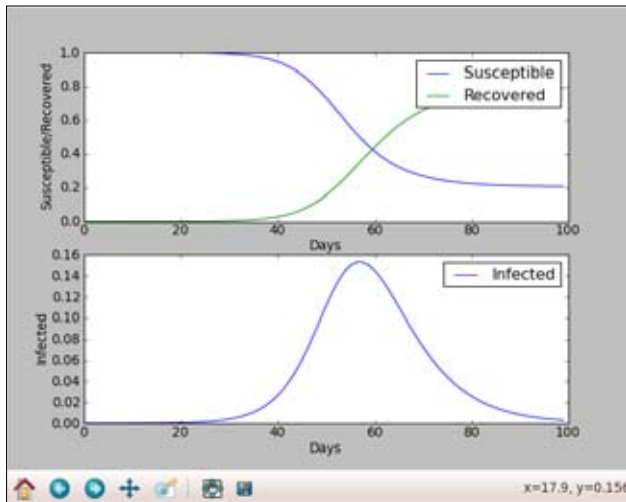


Figure 1: Susceptible, infected and recovered populations in a SIR model

```
b = .4 # Contact ratio is 2
t_array = np.arange(0, 100, 1)
RES = integrate.odeint(dif_eq, (S0,I0,R0), t_array,args=(b,k))
graph(RES)
```

You define a method *dif\_eq* which computes the derivatives for the system of differential equations. The parameters to this method are an array containing the current values, the current time and additional arguments -- *b* and *k*, in this case.

The key method is *odeint* whose parameters are a function defining the differential equations—for example, the *dif\_eq* above, a list containing the initial values, a time array at which solutions need to be found, and any additional arguments to the *dif\_eq* function. The best way to observe the results is graphically.

```
import matplotlib.pyplot as plt
def graph(RES):
    plt.subplot(2,1,1)
    plt.plot(t_array, RES[:,0], '-', label='Susceptible')
    plt.plot(t_array, RES[:,2], '-', label='Recovered')
    plt.xlabel('Days')
    plt.ylabel('Susceptible/Recovered')
    plt.legend()
    plt.subplot(2,1,2)
    plt.plot(t_array, RES[:,1], '-', label='Infected')
    plt.xlabel('Days')
    plt.ylabel('Infected')
    plt.legend()
    plt.show()
```

It is at times easier to show sub-plots. In the example above, a plot with two rows and one column is created. In the first row, a sub-plot shows the susceptible and recovered populations. The second sub-plot shows the infected population. The result is shown in Figure 1. The infections peak about 60 days after the outbreak and the

maximum people infected at one time is about 16 per cent, which is 1,60,000 in a population of a million!

## Impact of vaccinations and quarantine

Vaccination results in a reduction of the susceptible population. These people directly move into the recovered category without being infected. You can modify the *dif\_eq* method as follows:

```
def dif_eq_vac(V,t,b,k,vac):
    dVdt = np.zeros(3)
    dVdt[0] = -b*V[0]*V[1] - vac
    dVdt[1] = b*V[0]*V[1] - k*V[1]
    dVdt[2] = k*V[1] + vac
    return dVdt
```

If 1,000 or 5,000 people are vaccinated each day, you will need to modify your code to include:

```
t_array = np.arange(0, 200, 1)
RES1 = integrate.odeint(dif_eq, (S0,I0,R0), t_array,args=(b,k))
RES2 = integrate.odeint(dif_eq_vac, (S0,I0,R0), t_array,args=(b,k,1000/P))
RES3 = integrate.odeint(dif_eq_vac, (S0,I0,R0), t_array,args=(b,k,5000/P))
```

Let's suppose a fraction *q* of the infected are quarantined. Hence, only (1-*q*) fraction will be a part of the infected group. The remaining will be treated as recovered/removed. The code for the differential equations becomes, as follows:

```
def dif_eq_quarantine(V,t,b,k,q):
    dVdt = np.zeros(3)
    dVdt[0] = -b*V[0]*V[1]
    dVdt[1] = b*(1-q)*V[0]*V[1] - k*V[1]
    dVdt[2] = k*V[1] + b*q*V[0]*V[1]
    return dVdt
```

Let's assume that a third of the infected population is quarantined. Add the code and call the plot routine:

```
RES4 = integrate.odeint(dif_eq_quarantine, (S0,I0,R0), t_array,args=(b, k,
.333))
graph2(RES1, RES2, RES3, RES4)
```

The modified graph routine shows the infected populations, with and without vaccination:

```
def graph2(RES1, RES2, RES3, RES4):
    plt.plot(t_array, RES1[:,1], '-', label=None)
    plt.plot(t_array, RES2[:,1], '-', label='1000 per day')
    plt.plot(t_array, RES3[:,1], '-', label='5000 per day')
    plt.plot(t_array, RES4[:,1], '-', label='1/3 Quarantined')
    plt.xlabel('Days')
    plt.ylabel('Infected')
    plt.legend()
    plt.show()
```

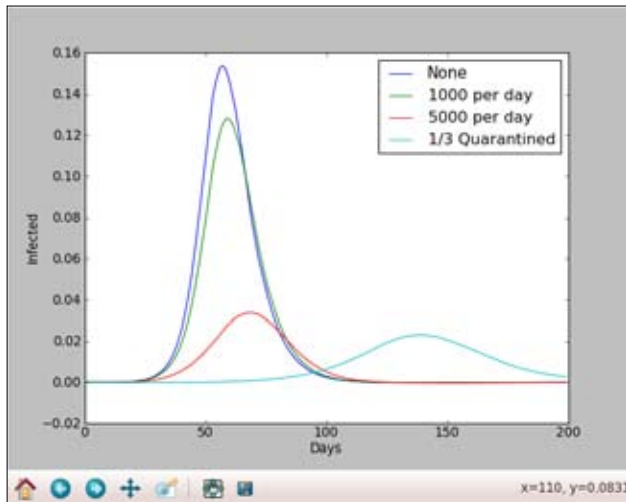


Figure 2: Impact of vaccination and quarantine on the infected populations


The results are shown in Figure 2. The infections now peak at 4 per cent about 70 days after the outbreak. The effect of a quarantine is dramatic even with only a third of the infected population isolated.

The intention of the above examples is to show the ease with which various models can be created and to analyse the impact of certain safety measures. Strategies can be implemented and monitored. The effort is not in coding. It is in developing models that can be verified

by observations. The model can be enhanced to include births, deaths and disease-induced mortalities and much more, as shown in the second reference.

The concept of viruses has been applied to ideas (meme), computer malware, viral marketing, etc. An interesting example is an application to the modelling of a zombie attack [www.wired.com/wiredscience/2009/08/zombies](http://www.wired.com/wiredscience/2009/08/zombies) and [www.mathstat.uottawa.ca/~rsmith/Zombies.pdf](http://www.mathstat.uottawa.ca/~rsmith/Zombies.pdf).

With the Scipy *integrate* module, you are not just restricted to understanding the dynamics of viruses and their impact on humans. Another very important model in biological systems is the predator-prey model. You can find a tutorial on using the Scipy *integrate* module to solve those equations at [www.scipy.org/LotkaVolterraTutorial](http://www.scipy.org/LotkaVolterraTutorial).

Furthermore, *pyplot* offers tremendous versatility and flexibility in presenting the results in an attention-grabbing way that quickly conveys the desired information. **END** 

#### References for the SIR model

- [www.math.duke.edu/education/ccp/materials/diffcalc/sir/sir3.html](http://www.math.duke.edu/education/ccp/materials/diffcalc/sir/sir3.html)
- [wiki.deductivethinking.com/wiki/Epidemiology](http://wiki.deductivethinking.com/wiki/Epidemiology)

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# Understanding the *sizeof* Operator

In C/C++, the *sizeof* operator is used extensively. In this column, we'll look at some simple and interesting aspects of the *sizeof* operator in a Q&A format.

Assume that the *sizeof* pointer size and *int* is 4.

1) Which is the only 'compile-time' operator in C?

2) Can *sizeof* return zero?

3) What does the following statement print?

```
printf("%d", sizeof(printf("hello")));
```

4) What will be the output of the statement below?

```
printf("%d %d", sizeof('1'), sizeof("1"));
```

5) What does the following program print?

```
#define SIZE(ARRAY) (sizeof(arr)/sizeof(arr[0]))
```

```
int size(int arr[]){
    return (sizeof(arr)/sizeof(arr[0]));
}
```

```
int main(){
    int arr[10];
    printf("%d %d", SIZE(arr), size(arr));
}
```

6) What is the output of the following statement?

```
printf("%d %d %d", sizeof(void *),
    sizeof(int *), sizeof(int **));
```

## The answers

1) A compile time operator means that the operator is evaluated entirely at compile-time. For the *sizeof* operator, its use results in a constant integer value (technically *size\_t* type) at compile-time. So, the only 'compile-time' operator in C is *sizeof* (except for variable length arrays where *sizeof* evaluates the size at runtime).

2) No. *sizeof* always returns the size of a variable or type, and so it cannot be zero. If you give an incomplete type (say a struct declaration or void type) as an argument to *sizeof*, it will result in a compiler error.


3) It prints 4. How about printing 'hello'? No, it does not print that! If *sizeof* is given a function call as argument, it returns the size of the return type. The return type of *printf* is *int* (*printf* returns the number of characters it successfully printed). Since we assumed *sizeof* *int* to be 4 here, the outer *printf* prints 4!

4) The output will be 1 2. For *sizeof*('1'), the argument is a character '1', and size of a character is 1 in C. For *sizeof*("1"), the argument "1" is a string literal, which has a terminating character '\0' in it; so the size of the string literal is 2.

5) It prints 10 1. C/C++ does not provide a direct way to find the size of an array. One widely-used 'trick' is to divide the size of the array by the size of the element of the array. The macro *SIZE* does precisely that.

Given the declaration "int arr[10];", *sizeof*(arr) is  $10 * 4 = 40$  bytes, since the array of size 10 is capable of holding 10 integers. The expression *sizeof*(arr[0]) is nothing but *sizeof*(int), which is 4. So the expression *sizeof*(arr)/*sizeof*(arr[0]) gives the value 10, which is the size of the array.

Coming to the *size* function, in the signature *int size(int arr[])*, the argument is "int arr[]". The argument is equivalent to the signature *int size(int \*arr)*! In C, we cannot pass whole arrays— we can only pass the base address of an array. So, in the *size* function, the expression "*sizeof*(arr)/*sizeof*(arr[0])" results in 1 assuming the size of the pointer and *int* is the same (4 bytes)!

6) The output is 4 4 4. The sizes of pointer types are the same, irrespective of the type of the pointer and the level of indirection! 

### About the author:

**S G Ganesh** is a research engineer in Siemens (Corporate Technology). His latest book is "Cracking the C, C++ and Java Interview", published by Tata McGraw-Hill. You can reach him at sgganesh@gmail.com.



# A Voyage to the Kernel



## Part 18

### Segment 3.7, Day 17

We have looked at various aspects of the Linux kernel over the past issues of this magazine. We have also tried to code and load our own module. Of late, our focus has shifted to the theoretical side of kernel design and implementation. I will try to wind up the theoretical aspects over a couple of articles, and then we can devote our time to trials.

We have already seen how the system organises processes into the user and kernel space. Figure 1 summarises the overall architecture of the design we have looked at. The figure encapsulates the various concepts we've discussed— the interaction of applications with the kernel, accessing system calls, using glibc, etc. If you have missed any one of the earlier columns, you can find them at [www.linuxforu.com](http://www.linuxforu.com).

In order to avoid some of the perplexities associated with the actual operations taking place, take a look at Figure 2, which illustrates the process in depth so that novice users can comprehend it well.

When discussing the configuration (modification) of kernel properties, I didn't mention the code that performs the action. Now we can look at some of the relevant portions that perform the related functions. If you need to review the 'global and useful constants' section, here is the associated code:

```
static ssize_t
ikconfig_read_current(struct file *file, char __user *buf,
                      size_t len, loff_t * offset)
{
    loff_t pos = *offset;
    ssize_t count;

    if (pos >= kernel_config_data_size)
        return 0;

    count = min(len, (size_t)(kernel_config_data_size - pos));
    if (copy_to_user(buf, kernel_config_data + MAGIC_SIZE + pos,
count))
        return -EFAULT;
```

```
*offset += count;
return count;
}
```

Now let's look at the *ikconfig\_init* segment (a critical one), which does the initiation:

```
static int __init ikconfig_init(void)
{
    struct proc_dir_entry *entry;

    /* create the current config file */
    entry = create_proc_entry("config.gz", S_IFREG | S_IRUGO,
                             &proc_root);

    if (!entry)
        return -ENOMEM;

    entry->proc_fops = &ikconfig_file_ops;
    entry->size = kernel_config_data_size;

    return 0;
}
```

And finally, here is the code that performs the clean-up work:

```
static void __exit ikconfig_cleanup(void)
{
    remove_proc_entry("config.gz", &proc_root);
}

module_init(ikconfig_init);
module_exit(ikconfig_cleanup);
```

#### Device drivers

It is very interesting to meddle around with device drivers (DD). And it is even more exciting to write our own DD! So here in this column, I will restrict myself to some of the basic ideas concerning DD and we will come back to this when we start our trial section.

Well, as you might know, in Linux, devices are represented as files. If you have not seen this, I suggest you glance through your */dev/* directory. You might think

that this is not a good idea since it allows unauthorised access to hardware. But that's not true. If you implement it in the proper way, the device can never be accessed wrongly by a program.

In Linux, you can find many drivers and they are identified by their unique major number. It is also interesting to note that since a particular DD may be used to control different physical and virtual devices (the HDD and partitions, for example), the individual device will be assigned a minor number (ranging from 0 to 255). You can comprehend this better if you look at the box titled 'Device driver nomenclature'.

Note the exceptions mentioned in the box. These exceptions are seen for DD corresponding to terminals and serial interfaces (which are assigned major numbers 4 and 5). Here, the devices with the number 4 are essentially virtual consoles, simple serial interfaces and pseudo-terminals. You may note that the virtual consoles are assigned the numbers ranging from 0 (which obviously corresponds to `tty0!`) to 63 and `/dev/tty0` or `/dev/console` corresponds to the current virtual console.

For a serial interface there are two logical devices—`ttysn` (dial-in device) and `cuans` (call-out device). When `ttysn` is opened, the kernel restricts access to it for other programs till the DTR line is active. And when it comes to the accessing of `cuans`, the corresponding process will be provided with immediate access to the serial interface (provided it is not in use). This will keep on blocking any process that tries to use `ttysn` (assigned with minor numbers 64 to 127). You can also see that the system assigns the minor numbers from 128 to 255 for pseudo-terminals. The master terminal (`ptyn`) is assigned `128+n` and the corresponding slave (`ttyn`) is given `192+n`.

The major number 5 is assigned for the current terminal and call-out devices. `/dev/tty` is given the minor number 0. And the corresponding `cuans` devices are assigned with minor numbers `64+n`.

Here is another list that could be handy when you write DD to access some input devices:

- 11 char Raw keyboard device (Linux/SPARC only)
  - 0 = `/dev/kbd` (raw keyboard device)
- 11 char Serial Mux device (Linux/PA-RISC only)
  - 0 = `/dev/ttyB0` (first mux port)
  - 1 = `/dev/ttyB1` (second mux port)
- 11 block SCSI CD-ROM devices
  - 0 = `/dev/scd0` (first SCSI CD-ROM)
  - 1 = `/dev/scd1` (second SCSI CD-ROM)

Akin to the filesystem (you can guess why it is so!), the DD is required to be 'made known' to the kernel. This is made possible with the help of the driver modules that are initialised while booting the system. When you code, the following list of functions will be helpful while performing this:

```
int register_chrdev(unsigned int major, const char * name, struct
    file_operations *fops);

int register_blkdev(unsigned int major, const char * name, struct
    file_operations *fops);
```

Since we are dealing with device drivers, I think some of you might be interested in the special initialisers that we use

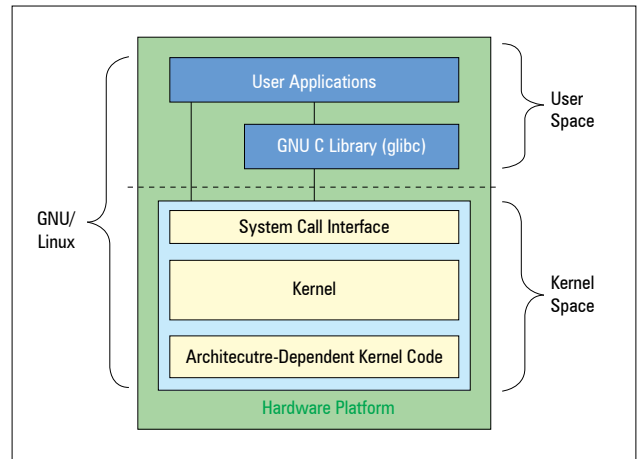


Figure 1: Tier architecture

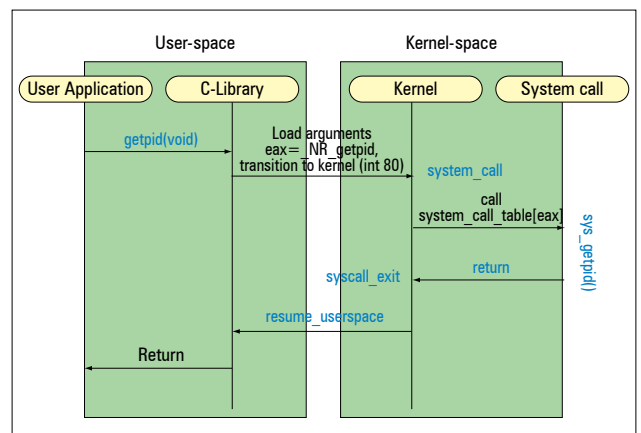


Figure 2: User space and kernel space

for USB Mass Storage devices:

```
#include <linux/sched.h>
#include <linux/errno.h>
#include "usb.h"
#include "initializers.h"
#include "debug.h"
#include "transport.h"

/* This places the Shuttle/SCM USB<->SCSI bridge devices in multi-target
 * mode */
int usb_stor_euscsi_init(struct us_data *us)
{
    int result;

    US_DEBUGP("Attempting to init eUSCSI bridge...\n");
    us->iobuf[0] = 0x1;
    result = usb_stor_control_msg(us, us->send_ctrl_pipe,
        0x0C, USB_RECIP_INTERFACE | USB_TYPE_VENDOR,
        0x01, 0x0, us->iobuf, 0x1, 5*HZ);
    US_DEBUGP("-- result is %d\n", result);

    return 0;
}
```

## Device driver nomenclature

## 0 Unnamed devices (e.g., non-device mounts)

0 = reserved as null device number

See block major 144, 145, 146 for expansion areas.

## 1 char Memory devices

1 = /dev/mem.....Physical memory access

2 = /dev/kmem.....Kernel virtual memory access

3 = /dev/null.....Null device

4 = /dev/port.....I/O port access

5 = /dev/zero.....Null byte source

6 = /dev/core.....OBSOLETE - replaced by /proc/kcore

7 = /dev/full.....Returns ENOSPC on write

8 = /dev/random.....Nondeterministic random number gen.

9 = /dev/urandom.....Faster, less secure random number gen.

10 = /dev/aio.....Asynchronous I/O notification interface

11 = /dev/kmsg.....Writes to this come out as printk's

## 1 block RAM disk

0 = /dev/ram0.....First RAM disk

1 = /dev/ram1.....Second RAM disk

...

250 = /dev/initrd.....Initial RAM disk {2.6}

Older kernels had /dev/ramdisk (1, 1) here /dev/initrd refers to a RAM disk which was preloaded by the boot loader; newer kernels use /dev/ram0 for the initrd.

## 2 char Pseudo-TTY masters

0 = /dev/ptyp0.....First PTY master

1 = /dev/ptyp1.....Second PTY master

...

255 = /dev/ptyef.....256th PTY master

## 2 block Floppy disks

0 = /dev/fd0.....Controller 0, drive 0, autodetect

1 = /dev/fd1.....Controller 0, drive 1, autodetect

2 = /dev/fd2.....Controller 0, drive 2, autodetect

3 = /dev/fd3.....Controller 0, drive 3, autodetect

128 = /dev/fd4.....Controller 1, drive 0, autodetect

129 = /dev/fd5.....Controller 1, drive 1, autodetect

130 = /dev/fd6.....Controller 1, drive 2, autodetect

131 = /dev/fd7.....Controller 1, drive 3, autodetect

and so on ...

*Continued on next page...*

```
/* This function is required to activate all four slots on
the UCR-61S2B
```

```
* flash reader */
```

```
int usb_stor_ucr61s2b_init(struct us_data *us)
```

```
{
```

```
    struct bulk_cb_wrap *bcb = (struct bulk_cb_
wrap*) us->iobuf;
```

```
    struct bulk_cs_wrap *bcs = (struct bulk_cs_
wrap*) us->iobuf;
```

```
    int res, partial;
```

```
    static char init_string[] = "\xec\x0a\x06\
x00$PCCHIPS";
```

```
    US_DEBUGP("Sending UCR-61S2B initialization
packet...\n");
```

```
    bcb->Signature = cpu_to_le32(US_BULK_CB_
SIGN);
```

```
    bcb->Tag = 0;
```

```
    bcb->DataTransferLength = cpu_to_le32(0);
```

```
    bcb->Flags = bcb->Lun = 0;
```

```
    bcb->Length = sizeof(init_string) - 1;
```

```
    memset(bcb->CDB, 0, sizeof(bcb->CDB));
```

```
    memcpy(bcb->CDB, init_string, sizeof(init_string)
```

```
- 1);
```

```
    res = usb_stor_bulk_transfer_buf(us, us->send_
bulk_pipe, bcb,
```

```
        US_BULK_CB_WRAP_LEN, &partial);
```

```
    if(res)
```

```
        return res;
```

```
    US_DEBUGP("Getting status packet...\n");
```

```
    res = usb_stor_bulk_transfer_buf(us, us->recv_
bulk_pipe, bcs,
```

```
        US_BULK_CS_WRAP_LEN, &partial);
```

```
    return (res ? -1 : 0);
```

```
}
```

We can meddle with all these when we begin our experimental session!

In case the DD is already registered under a particular major number and the corresponding file operation does not match with those, then the *register\_chrdev()* function will return a negative value.

You may come across two types of devices—viz., block-oriented and character-oriented devices. In the case of the first set of devices, any given block can be read or written to at the will of the programmer (i.e., they support random access). This task is done using cache. This feature

of random access is essential for filesystems. So you can guess why we are mounting them as block devices. In the second case, the access can be processed sequentially (without using a buffer). Devices like printers, scanners, sound cards, etc, come under this. But you may note that some of the internal operations of these devices still rely on blocks that are, again, inaccessible randomly.

*Polling count* helps us to track errors in the data terminal. It also has a timeout feature, which is illustrated in the following code:

```
if(need_resched) schedule();
} while(!LP_READY(minor,status) && count <
LP_CHAR(minor));
if (count == LP_CHAR(minor)) { return 0;
/* Timeout, current character not printed */
outb_p( lpcchar,
LP_B(minor));
return 1;
}
```

You can find that the *LP\_CHAR(minor)* count is set to *LP\_INIT\_CHAR*. This can be changed using *ioctl*. The *ioctl* functionality (part of the system call) is used to provide access to the device kernel space.

Here is the code that performs the initialisation activity of the function:

```
static long do_ioctl(struct file *filp, unsigned int cmd,
unsigned long arg)
{
int error = -ENOTTY;

if (!filp->f_op)
goto out;

if (filp->f_op->unlocked_ioctl) {
error = filp->f_op->unlocked_ioctl(filp, cmd,
arg);
if (error == -ENOIOCTLCMD)
error = -EINVAL;
goto out;
} else if (filp->f_op->ioctl) {
lock_kernel();
error = filp->f_op->ioctl(filp->f_dentry-
>d_inode,
filp, cmd, arg);
unlock_kernel();
}
```

Continued from previous page...

## Device driver nomenclature

However, you may come across an 'exception' to this rule if you look at the following list:

### 4 char TTY devices

```
0 = /dev/tty0.....Current virtual console
1 = /dev/tty1.....First virtual console
...
63 = /dev/tty63.....63rd virtual console
64 = /dev/ttyS0.....First UART serial port
...
255 = /dev/ttyS191.....192nd UART serial port
```

UART serial ports refer to 8250/16450/16550 series devices.

Older versions of the Linux kernel used this major number for BSD PTY devices. As of Linux 2.1.115, this is no longer supported. Use major numbers 2 and 3.

### 4 block

Aliases for dynamically allocated major devices to be used when it's not possible to create the real device nodes because the root filesystem is mounted as read-only.

```
0 = /dev/root
```

### 5 char Alternate TTY devices

```
0 = /dev/tty.....Current TTY device
1 = /dev/console.....System console
2 = /dev/ptmx.....PTY master multiplex
64 = /dev/cua0.....Callout device for ttyS0
...
255 = /dev/cua191.....Callout device for ttyS191
```

```
out:
return error;
}

static int file_ioctl(struct file *filp, unsigned int cmd,
unsigned long arg)
{
int error;
int block;
struct inode * inode = filp->f_dentry->d_inode;
int __user *p = (int __user *)arg;

switch (cmd) {
case FIBMAP:
{
struct address_space *mapping = filp-
>f_mapping;
int res;
/* do we support this mess? */
if (!mapping->a_ops->bmap)
return -EINVAL;
if (!capable(CAP_SYS_RAWIO))
return -EPERM;
if ((error = get_user(block, p)) != 0)
return error;

lock_kernel();
res = mapping->a_ops-
>bmap(mapping, block);
```



```

        unlock_kernel();
        return put_user(res, p);
    }
    case FIGETBSZ:
        if (inode->i_sb == NULL)
            return -EBADF;
        return put_user(inode->i_sb->s_blocksize, p);
    case FIONREAD:
        return put_user(l_size_read(inode) - filp->f_pos, p);
}

return do_ioctl(filp, cmd, arg);
}

```

## Networking

Today, we will look at some of the fundamental functionalities (that can handle network services) required when you code. Since some of our readers may not have a strong background in networking, we will spend some time reviewing the basic networking related concepts.

In Linux, you can use sockets for accessing network services. And you can employ the following functionalities to do higher-end tasks:

```

int socket(int addr_family, int type, int protocol);
int bind(int s, struct sockaddr *address, int address_len);
int listen(int s, int backlog);
int connect(int s, struct sockaddr *address, int address_len);
int accept(int s, struct sockaddr *address, int *address_len);
int send(int s, char *msg, int len, int flags);
int sendto(int s, char *msg, int len, int flags, struct sockaddr *to, int tolen);
int recv(int s, char *buf, int len, int flags);
int recvfrom(int s, char *buf, int len, int flags, struct sockaddr *from, int *fromlen);
struct sockaddr *frro, int *fromlen);
int getsockopt(int s, int level, int oname, char *ovalue, int *olen);
int setsockopt(int s, int level, int oname, char *ovalue, int *olen);

```

The above code shows the set of C library routines that are included in the interface. It is important to note that these functions rely on the system call *socketcall*. The socket function is initiated by the following code:

```

static int sock_no_open(struct inode *irrelevant, struct file *dontcare);
static ssize_t sock_aio_read(struct kiocb *iocb, char __user *buf,
                             size_t size, loff_t pos);
static ssize_t sock_aio_write(struct kiocb *iocb, const char __user *buf,
                              size_t size, loff_t pos);
static int sock_mmap(struct file *file, struct vm_area_struct *vma);

static int sock_close(struct inode *inode, struct file *file);
static unsigned int sock_poll(struct file *file,
                              struct poll_table_struct *wait);
static long sock_ioctl(struct file *file,

```

```

        unsigned int cmd, unsigned long arg);
static int sock_fasync(int fd, struct file *filp, int on);
static ssize_t sock_readv(struct file *file, const struct iovec *vector,
                          unsigned long count, loff_t *ppos);
static ssize_t sock_writev(struct file *file, const struct iovec *vector,
                           unsigned long count, loff_t *ppos);
static ssize_t sock_sendpage(struct file *file, struct page *page,
                             int offset, size_t size, loff_t *ppos, int more);

static struct file_operations socket_file_ops = {
    .owner = THIS_MODULE,
    .llseek = no_llseek,
    .aio_read = sock_aio_read,
    .aio_write = sock_aio_write,
    .poll = sock_poll,
    .unlocked_ioctl = sock_ioctl,
    .mmap = sock_mmap,
    .open = sock_no_open, /* special open code to disallow open via /proc */
    .release = sock_close,
    .fasync = sock_fasync,
    .readv = sock_readv,
    .writev = sock_writev,
    .sendpage = sock_sendpage
};

```

Various functions like *net\_family\_write\_lock* are also included:

```

static void net_family_write_lock(void)
{
    spin_lock(&net_family_lock);
    while (atomic_read(&net_family_lockct) != 0) {
        spin_unlock(&net_family_lock);

        yield();

        spin_lock(&net_family_lock);
    }
}

```

As I said, since networking in Linux is a vast subject, we will be dedicating the next article entirely to it. I will also be briefing readers about the basic concepts required to meddle with networking in Linux. I would recommend that you refer to an undergraduate module in networking, if you don't have a clear picture. I will be including concepts related to the layer architecture models, protocols, conversion algorithms, etc, in the next column.

Happy kernel hacking!  **END**

**By: Aasis Vinayak PG**

The author is a hacker and a free software activist who does programming in the open source domain. He is the developer of V-language—a programming language that employs AI and ANN. His research work/publications are available at [www.aasisvinayak.com](http://www.aasisvinayak.com)

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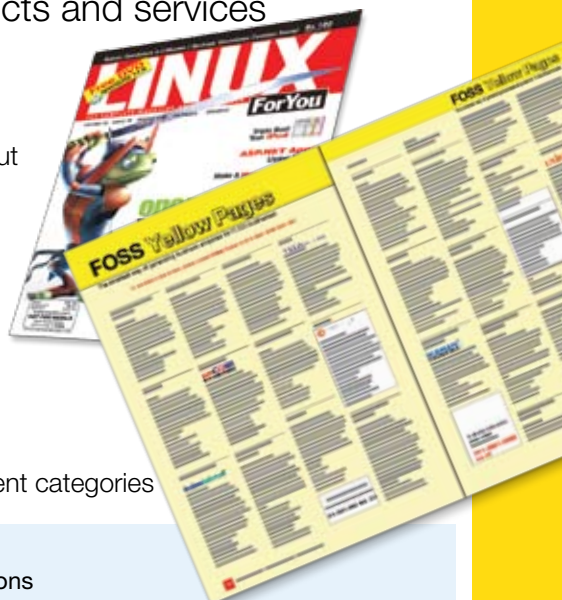
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